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PULMONARY TUBERCULOSIS AS A CAUSE OF PAIN IN THE SHOULDER[1]

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THE causes of pain in the region of the shoulder are numerous. Among them are the various arthropathies and injuries common to other joints. Subacromial bursitis is a common cause, and referred pain from lesions or abnormalities of structures more or less remote is not infrequent.

Among the latter may be mentioned cervical ribs and diseases of the upper spine. Pain may also be referred to the shoulder in diseases of the liver and bile passages, due to efferent stimuli coming up the phrenic nerve to the spinal center of the fourth cervical. The same factor is operative in producing pain in the shoulder in diaphragmatic pleurisy. Pain in the shoulder may also be a prominent symptom in cardiovascular disease, particularly in diseases of the coronary vessels and aorta. Mackenzie states that such pain is always referred—a viscerosensory reflex.

Pulmonary tuberculosis is also a well-recognized cause of pain in the shoulder. In many cases of referred pain to the shoulder there are other concurrent clinical manifestations which will enable the alert clinician to determine their sources of origin. This, however, is not always the case. A. J. Jex-Blake, in an "Index of Differential Diagnosis of Main Symptoms," states that "it must be remembered that identical areas of referred chest tenderness may be observed in disorders of such various organs as the heart, lungs, liver, and stomach; and that a patient may be long treated for 'rheumatism' of the shoulder, for example, when he is really suffering from one or more of such widely different disorders as pulmonary tuberculosis, gallstones, gastritis, or coronary sclerosis." The same author lays particular stress upon pulmonary tuberculosis as a cause of pain in the shoulder. He states that "the tenderness may be either superficial or deep; sometimes so marked as to be elicited by the pressure of the clothes. It is generally felt most about the region of the apices of the lungs, the curve of the shoulder or the scapula. It is often a very chronic trouble, vanishing during periods of general improvement, returning again when the patient's health is low or the pulmonary lesion is progressing."

Although we have been unable to make as complete a study of the subject as we would desire, we have become convinced that it does not receive the consideration that its importance merits.

We have seen but scant reference to it in the literature, and we do not remember having heard it referred to by our confrères with whom we come in contact from day to day.

It is quite certain that many cases in which pain in the shoulder is the only, or at least the dominant, symptom drag along from month to month without an adequate explanation as to its cause. They make the round of the orthopedist, rhinologist, dentist, roentgenologist, osteopath, neurologist, *et al*, with little or no consideration being

[1] Read by Dr. A. C. Christie before the Radiological Society of North America, Chicago, June, 1924.

given to the chest as a possible source of origin of the pain and disability.

When patients are referred to the roentgenologist for examination of the shoulder, it is seldom that the films used are large enough, or are made in such a manner as to be of any value in the recognition of intrathoracic disease.

Some years ago, however, by chance we occasionally noticed a pulmonary lesion in the patients referred for shoulder examination. Later we have made some effort to relate these findings to the symptoms. Practically the only symptom of which these patients complained was pain in the region of the shoulder. The pain is usually described as a soreness or ache which is more or less chronic, and while, as a rule, not very acute, is distinctly annoying and interferes to a variable degree with normal activity. When patients are asked to localize the pain they usually grasp the entire curve of the shoulder and are unable to localize it as accurately as do patients with subacromial bursitis. Motion is not restricted, but aggravates the pain, although the pain may not be referred to the joint itself. There is usually some general tenderness on deep pressure. There is no swelling nor atrophy.

These patients generally deny or are unaware of any pulmonary symptoms, and consider themselves well except for the "rheumatism in the shoulder," as they usually diagnose their complaint.

The lung lesion as seen roentgenographically has the characteristics of chronic pulmonary tuberculosis. The area of involvement is variable. Usually the disease extends high up in the apex and frequently well out to the periphery toward the axilla. Definite thickening of the pleura at the apex can frequently be made out. The roentgen appearance may be that of an arrested or an obsolete process with areas of calcification. I do not think, however, that such would necessarily preclude the possibility of a causal relationship to the pain in the shoulder. Not infrequently the lung lesion has been shown to be bilateral when the shoulder symptoms have been unilateral.

Comparatively few of the cases which we have seen have had what we consider an adequate clinical study. In general, however, it may be stated that they have been characterized by a paucity of signs and symptoms referable to the lungs. It is well known that this is not uncommon in chronic pulmonary tuberculosis, even though the structural changes are quite extensive.

Of course, it is not to be inferred that the lung lesion is the cause of the shoulder symptoms in every case in which they are co-existent, and a causal relationship can be considered reasonably certain only when other causes have been excluded as far as possible.

The prevailing opinion as to the mechanism by which pain in the shoulder is produced in visceral disease, is that it is always a viscerosensory reflex. When we remember, however, the very close anatomic relationship which exists between the apex of the lung and the structures at the root of the neck and shoulder, it would seem possible that in some cases there may be a more direct relationship of cause and effect.

SUMMARY AND CONCLUSIONS

1. Pain in the shoulder may be the dominant or only symptom of pulmonary tuberculosis.

2. The causal relationship is frequently unrecognized.

3. Shoulder pain which is not otherwise satisfactorily explained should direct attention to the chest as a possible source of origin.

4. The roentgen examination of the chest may be the determining factor in arriving at a correct diagnosis.

ROENTGENOLOGIC EVIDENCE OF SPINAL-CORD TUMORS: REPORT OF THREE CASES[1]

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TUMORS of the spinal cord are among the rarer affections of the central nervous system. Frazier, in 1918, was able to collect only 330 cases in which operation had disclosed the tumor. Frazier's report does not include 135 cases recorded by Schlesinger, which were found in 35,000 necropsies over a period of eighteen years in Das Allgemeine Krankenhaus, Vienna. Since his report, Adson has added 119 cases of his own, in which operation was performed. Sargent has reported 27 cases, and Elsberg, 67. Some of these, no doubt, are represented in Frazier's collection. Browning, in a review of the literature, collected 80 cases of tuberculosis of the spinal cord.

We have been able to find but few references in the literature to the direct X-ray evidence of spinal-cord tumors. Adson has commented on the erosion of the vertebral processes as a result of a spinal-cord tumor. Pancoast says, "Tumors of the spinal cord cannot be diagnosed by this method, and if by any chance they involve the vertebræ secondarily, the appearance is in no way suggestive of their primary origin." According to Elsberg, the extradural tumors, more especially the sarcomas, may cause absorption of bone, which can be recognized in the roentgenogram. The X-ray shows that one or several laminæ have been absorbed. This is due to the pressure of the tumor on the arches of the vertebræ. Elsberg does not present roentgenograms showing the condition.

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According to Adson, the type of the spinal-cord tumor depends chiefly on its point of origin: those arising from the vertebræ are bony or cartilaginous; those arising from the meninges are endotheliomas, psammomas, and so forth. Such tumors are rarely malignant, are slow growing, and do not become very large. Tumors of the cord itself are usually gliomas; some degenerate and become cystic, others remain firm and solid. Ependymal gliomas arise from the conus and extend down through the canal of the lumbar region.

Steinke classifies spinal-cord tumors into four general groups: (1) extramedullary (intradural and extradural); (2) intramedullary; (3) tumors of the cauda equina; and (4) vertebral (primary and secondary).

The growths most often encountered by the surgeon are fibromas, sarcomas, gliomas, endotheliomas, psammomas, lipomas, tuberculous tumors, and gummas. Exostoses, chondromas, and so forth, occur but rarely.

Potel and Veaudeau found that 52 per cent of all spinal-cord tumors occurred in the thoracic vertebræ, 20 per cent in the cervical region, and 28 per cent in the cauda equina and lumbosacral vertebræ. These figures were subsequently borne out by Frazier's cases; 152 of his cases were meningeal, 58 vertebral, 36 intramedullary, and 30 caudal. In 54 cases the point of origin was not stated.

SYMPTOMS

The symptoms of spinal-cord tumor are not always typical; however, a thorough history and a careful neurologic examination will give the clinician the correct diagnosis in a fair percentage of cases. The softer neoplasms and intramedullary tumors follow a very slow course, while the hard encapsulated tumors, by producing pressure, cause more severe symptoms, and paralysis within a few months. Tumors

[1]The scope of this paper has purposely been limited to the direct X-ray evidence of spinal-cord tumors. The authors are familiar with the use of lipiodol in the localization and diagnosis of spinal-cord tumors. They are also aware that spinal-cord tumors can at times be diagnosed by the use of spinal ventriculography. They merely wish to show the extreme rarity with which direct X-ray evidence occurs and to report certain cases to illustrate these changes.

pressing dorsally on the cord will produce sensory changes first, whereas those situated laterally or anteriorly more often give a fairly typical Brown-Séquard's syndrome in the early stages of the affection. Root

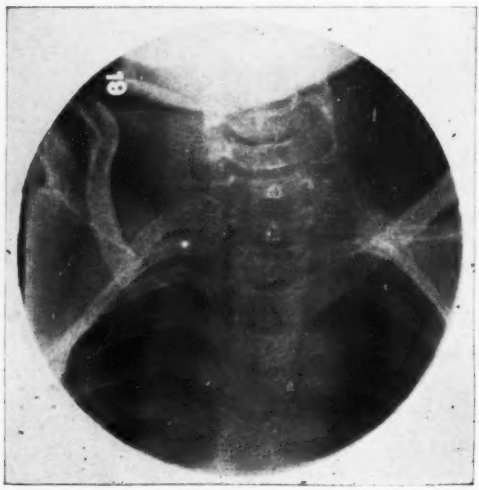

Fig. 1. Tumor of spinal cord with erosion of the lateral processes of the fourth, fifth, sixth, and seventh cervical vertebræ on the left side. The appearance in the roentgenogram is that of a bone cyst.

pain is probably the most important and persistent symptom encountered in spinal-cord tumors, but it is not present in all cases. Extradural growths are usually characterized by very indefinite sensory and motor disturbances at the onset. In the intramedullary tumors numbness and tingling of the skin and atrophy of the muscles may be among the earliest symptoms.

REPORT OF CASES

Case 1 (A282347). A boy, aged twelve years, came to the Clinic August 2, 1919, complaining of paralysis of the legs and hands, and sharp pain in the cervical spine. The trouble began in March, 1915, when he noticed sharp pains in the left arm during the night. Six months later he began to have severe pain in the spine at the level of the shoulders; this also occurred at night. The patient suffered no discomfort during the day and was able to play with the other children. Within a few weeks, however, he developed a high fever, and the pain in the spine and arm became much worse. Following this there was a loss of strength in the left foot and arm. In December, 1915, the boy's mother noticed beginning weakness in the right side, and he gradually became completely paralyzed. During this time, pain in the spine was constant.

Physical examination revealed marked atrophy of the muscles of all the extremities, and areas of paresthesia and anesthesia of varying degree over the entire trunk, and lower and upper extremities. An X-ray of the cervical spine disclosed a cystic area at the left side of the fifth and sixth cervical vertebræ and slight involvement of the seventh (Fig. 1).

At operation an intramedullary spinal-cord tumor was found, measuring 8.75 cm. in length and 3.75 cm. in diameter. The tumor was not encapsulated. The areas of erosion described in the roentgenogram coincided with the findings of the surgeon. The pathologic diagnosis was neuro-fibroma.

Case 2 (A341775). A man, aged twenty-six years, came to the Clinic November 23, 1920, complaining of an area of tenderness in the median lumbar region over the vertebræ, and retention of urine. The tenderness over the lumbar vertebræ had been noted since 1915, but was not severe until September, 1918, while the patient was in the army. At this time he developed a distinct soreness over the lumbar vertebræ and constant aching pains in both lower extremities, associated with sharp shooting pains in the pelvis and posterior surface of the thighs. The urinary retention had been present for a month only.

Physical examination was negative except for an area of marked tenderness over the fifth lumbar vertebra, relaxation of the sphincter, and areas of anesthesia over the buttocks and scrotum. The patient's gait was slow and painful, very similar to that observed in cases of severe sacro-iliac strain. X-ray examination of the spine showed an abscess of the lamina and spinous processes of the first and second sacral vertebræ, apparently due to erosion of the bone by tumor.

At operation an ependymal glioma, extending from the tenth thoracic vertebra to the second sacral vertebra, was found. The first, second and third sacral laminæ were missing, and the tumor had crowded into this space. Because of the extensive involvement, the tumor was not removed. Following the operation the patient developed acute purulent meningitis and died. The tumor examined at necropsy measured 14 by 5 by 2 cm. There was definite erosion at the base of the second, third, fourth and fifth lumbar vertebræ, and the first three sacral vertebræ were eroded, as seen in the roentgenogram (Fig. 2). It is difficult to determine whether there had been a congenital spina bifida which had been enlarged by erosion, or whether the condition was primarily due to the tumor of the cauda equina.

Case 3 (A142990). A young woman, aged twenty years, came to the Clinic, October 8, 1915, because of paralysis of the lower limbs and a lump just to the right of the dorsolumbar spine. Her symptoms began in 1911 when she fell suddenly during a game of basket-ball. She

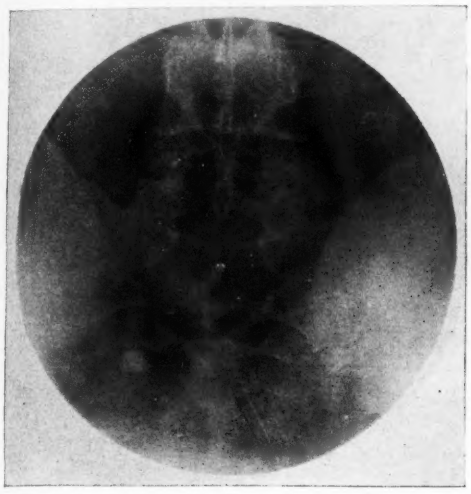

Fig. 2. Tumor of spinal cord producing a central erosion and cystic appearance of the first three sacral vertebræ. It could not be determined at necropsy whether there was originally a spina bifida which was enlarged by erosion, or erosion of normal vertebræ by the tumor solely.

got up immediately and felt perfectly well. This first attack of falling was followed by others with increasing frequency. About three months later, she first experienced difficulty in going upstairs, her right leg giving her the most trouble. Since then the symptoms had been progressive, first paralysis of the right foot, then of the right leg, and finally of the left leg; the sphincters of the bowel and bladder also became involved. Two years previous to coming to the Clinic, she first noticed a small mass just to the right of the twelfth dorsal vertebra. This had gradually enlarged until at the time of examination it was about 6.25 cm. in diameter. There was spastic paralysis of both lower extremities, together with loss of reflexes and disturbances of skin sensibility. The patient was operated on October 18, 1915, when the tumor previously described was completely removed. It was found to be not connected with the vertebral column. When examined microscopically, it proved to be a fibroma. A second operation was performed October 27, 1915, when a large fibroma which had eroded the eleventh and twelfth dorsal arches was exposed and removed. The tumor was found outside the dura, completely compressing the cord. It was irregular in shape, and extended from the ninth dorsal to the first lumbar vertebra, growing out between the arches along the bodies of the vertebræ between the tenth dorsal and the first lumbar. The roentgenogram made of the lateral spine is characteristic, revealing a definite erosion of the dorsal arches which corresponded to the erosion found at the time of operation (Fig. 3).

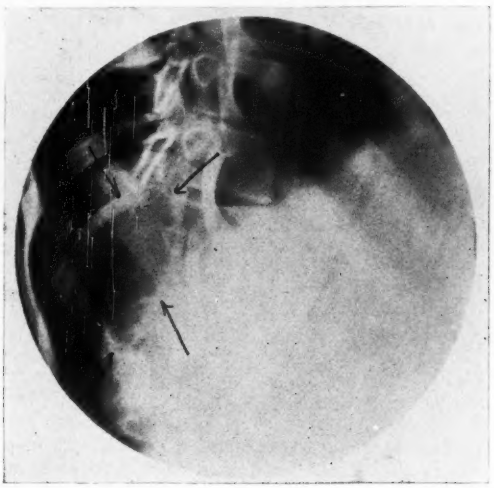

Fig. 3. Fibroma of cord eroding dorsal arches of eleventh and twelfth dorsal vertebræ, giving the appearance of a trabeculated cyst. Note that the spinous process of the eleventh vertebra and a large part of that of the twelfth have been absorbed.

DISCUSSION

The diagnosis of spinal-cord tumor in the roentgenogram is made possible only by sufficient erosion of the laminæ of the vertebræ, or of the vertebræ themselves, so that the erosion can be recognized in the roentgenogram. In the great majority of cases this is impossible; thus, of 119 certified cases of spinal-cord tumor in which operation was performed at the Mayo Clinic, only three gave positive X-ray evidence. Furthermore, it is impossible to demonstrate the spinal-cord tumors themselves, owing to the density of the vertebræ and the complexity of their anatomy. The practical value of direct X-ray evidence is slight. Apparently any type of spinal-cord tumor can produce sufficient erosion to give roentgenographic evidence. In the first

case, the tumor was intramedullary; in the second, it was an ependymal glioma of the cauda equina, while in the third, the tumor was extradural. This last case is illustrative of the type of tumor described by Elsberg, in which erosion of the dorsal laminæ would be expected.

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Roentgen-ray treatment of carbuncles.—The author states that the value of the roentgen ray in the treatment of carbuncles and allied conditions is not generally known, and reports the results in nine such cases treated by him.

In all the cases the pain was almost entirely relieved in from six to twenty-four hours. In five of the nine cases, the pathology changed rapidly, usually within two days, into a fairly large central abscess which drained freely for two to three days and promptly healed. It was noted that the action of the roentgen ray was particularly striking in the type of inflammation where there was lymphangitis and where the inflammation or cellulitis was almost of the erysipelas type. For this reason the author believes that the roentgen ray may be of value in erysipelas.

The following technic was used: 4 milliamperes, 9-inch spark gap, 9 millimeters of aluminum filter, 9-inch distance and 8 minutes' time. One-half of the dose was repeated on the fourth day if necessary. The area treated included at least one inch of healthy tissue around the lesion. A small incision was made as soon as any part of the indurated area showed any softening. The wound was dressed daily but no chemicals or lotions were applied.

The author draws the following conclusions: (1) Every carbuncle should have roentgen therapy as soon as the diagnosis is made; (2) a small incision should be made when softening first occurs; (3) the pain is greatly relieved in most cases and entirely relieved in many; (4) the infection is usually limited and the duration of the disease shortened; (5) there is very little scarring following this method and no danger or pain with the radiation itself; (6) other localized infections of the skin and subcutaneous tissues respond very similarly to the roentgen ray; (7) areas of lymphangitis extending for some distance away from the localized lesion usually disappear a few hours after treatment.

J. D. Camp, M.D.

The Roentgen Ray in the Treatment of Carbuncles and Other Infections. F. M. Hodges. Am. Jour. Roentgenol. and Rad. Ther., May, 1924, p. 442.

PATHOLOGY IN THE RIGHT UPPER ABDOMEN[1]

Value of X-ray Signs as Checked by Operative Findings in 164 Cases

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THE right upper quadrant of the abdomen ranks next to the ileocecal region in point of frequency as the site of gastro-intestinal disease. Pathology in the right upper abdomen, thanks to the recent improvements in equipment and refinement of technic, is being more and more completely portrayed by the radiologist. The value of X-ray signs or groups of signs, as expressive of this pathology, is being more accurately worked out.

The writer does not hope to add anything new to the equipment for X-ray diagnosis in this region. His only thought is to make, from his personal experience, some contribution toward the statistical record of X-ray signs as proven by operative findings.

For this purpose a survey has been made of 164 operations on the right upper abdomen. In a series of tables will be shown a classified list of the disease conditions found, and a percentage classification of the X-ray findings pertaining to each of these disease conditions.

Table I gives an analysis of the conditions found by the surgeons at operation. It is at once apparent that the major rôle in upper right abdominal diseases is played by the gall bladder and by bands and adhesions. Either adhesions or bands occurred in 104 of the cases, and 70 per cent of these adhesions or bands were associated with gall-bladder disease. Chronic cholecystitis occurred in 84 of the cases, and 75 per cent of these gall-bladder conditions were accompanied by bands or adhesions.

Let it be made clear that bands and adhesions are not interchangeable names but represent quite distinct conditions. Bands, or membranes, or veils are more or less highly organized structures passing from viscus to viscus, or from viscus to posterior or lateral peritoneal wall; usually constricting the viscus and possibly fixating it. Adhesions involve the gluing of viscus to viscus, or viscus to any part of the peritoneal wall. This gluing process is made possible by some damage of the apposing peritoneal surfaces, whether visceral or parietal,—in other words, a peritonitis.

Table I, Operative Findings in 164 Cases

1. Right upper abdomen normal..... 26 cases
   - Chronic appendicitis .....15 cases
   - Ileocecal bands .....20 cases
2. Adhesions or bands.....104 cases
   - Alone .....35 cases
   - With chronic cholecystitis..43 cases
   - With chronic cholecystitis and gallstones .....18 cases } 70%
   - With chronic cholecystitis and duodenal ulcer..... 2 cases
   - With duodenal ulcer..... 6 cases
3. Chronic cholecystitis ..... 84 cases
   - Alone ..... 7 cases
   - With gallstones .....12 cases
   - With adhesions and bands..43 cases
   - With gallstones and adhesions or bands.....18 cases } 75%
   - With duodenal ulcer and adhesions or bands..... 2 cases
   - With duodenal ulcer..... 2 cases
4. Duodenal ulcer ..... 14 cases
   - With adhesions or bands.. 8 cases (61%)
5. Carcinoma of stomach..... 7 cases
6. Carcinoma of gall bladder..... 1 case
7. Multiple cysts of liver..... 1 case
8. Pancreatic disease ..... 4 cases

Note:
- No diverticula of duodenum
- No carcinoma of duodenum } found in this series.
- No gastric ulcer

The differential diagnosis between bands and adhesions, and an attempt to trace the cause of each, so far as concerns the upper right abdomen, will be made in Table III.

One is rather struck with the comparatively minor rôle which duodenal ulcer plays in this series, especially since these are not selected cases, but a consecutive series of operations on the right upper abdomen.

Equally significant is the comparative rarity of pancreatic disease; at least, rare so far as the surgeon could determine by observation and palpation through the open incision. It certainly does not confirm the

[1]Read before the Radiological Society of North America, Rochester, Minnesota, December, 1923.

Fig. 1. X-ray report: Enlarged gall bladder (midway between shadows of liver and kidney). Diagnosis: Gall bladder diseased and enlarged. Operative findings: Hydrops of gall bladder. Gall bladder size of a tumbler.

Fig. 2. X-ray report: Gall-bladder shadow (above and internal to right kidney shadow). Diagnosis: Gall-bladder disease. Operative findings: Gall bladder thick and fibrous.

Fig. 3. X-ray report: Differentiation of gall-bladder shadow from that of right kidney by means of a pyelogram. Diagnosis: Gall-bladder disease. Operative findings: Gall bladder large, white, and full of stones.

view of those who hold that pancreatic disease nearly always accompanies gall-bladder disease.

Table II (Part 1), The X-ray Findings in 164 Cases

1. In the 26 normal cases—
   - Tenderness was present in..10 cases
   - Duodenum was deformed in..10 cases
   - Ileocecal bands showed in..20 cases
   - Chronic appendix showed in..12 cases
2. In the 14 duodenal ulcer cases—
   - Duodenal cap irregular in..10 cases
   - Tenderness present in..... 8 cases
   - Second portion duodenum deformed ..... 6 cases (in 5 of which adhesions were found)
   - Hyperperistalsis present in. 6 cases
3. In the 7 carcinoma of stomach cases—
   - Duodenal cap invisible in.. 3 cases (pyloric cancer)
   - Delay in stomach evacuation in ..... 4 cases (pyloric cancer)
   - Defect of filling noted in all the cases.
4. In the carcinoma of gall bladder—
   - Gall-bladder shadow visible on film.
5. In the multiple cyst of liver—
   - Cyst shadow on film, miscalled gall bladder.
6. In the 4 pancreatic disease cases—
   - Three associated with carcinoma of pylorus.
   - One inflammatory, associated with gall-bladder disease.
   - There were no distinctive appearances.

Table II (Part 2), The X-ray Findings *(continued)*

7. In the 104 bands or adhesions and 84 chronic cholecystites—

A. Direct gall-bladder evidence.

(1) Gall-bladder shadow shown on film in 67 per cent of the cases.

(2) Gallstone shadow shown on film in 67 per cent of the cases.

B. Indirect gall-bladder evidence.

	Gall-bladder disease	Bands or adhesions	G. B. disease plus bands or adhesions
(1) Tenderness	95%	65%	83%
(2) Duodenal deformity: Hitched up, overvisualized, angulated, irregular, flat	32%	68%	50%
(3) Spasticity of pylorus and duodenum	32%	46%	33%
(4) Concavity on duodenum or pylorus from gall-bladder pressure.	5%	0	13%
(5) Hyperperistalsis	16%	23%	22%

In the 26 cases in which no pathology was found in the right upper abdomen at operation, it will be noted that chronic appendicitis was found in 15 cases and ileocecal bands in 20 cases. The significance of these findings will be discussed under Table II.

Table II is an effort to make a systematic classification of the X-ray appearances cor-

Fig. 4. X-ray report: Gall bladder with gallstones (liver and right kidney shown). Diagnosis: Gall-bladder disease and gallstones. Operative findings: Gall bladder large and packed with stones and pus.

Fig. 5. X-ray report: Large gall bladder containing large gallstone. Diagnosis: Gall-bladder disease and gallstone. Operative findings: Gall bladder diseased and constricted in center; contained large gallstone.

Fig. 6. X-ray report: Greatly enlarged gall bladder, containing a group of gallstones. One gallstone in duct. Diagnosis: Gall-bladder disease; gallstones in gall bladder and duct. Operative findings: Gall bladder large, white, thick, and full of stones. Gallstone in cystic duct.

responding to the various types of operative findings. It is divided into Parts 1 and 2. Part 1 deals with the less frequent conditions found. The X-ray appearances are classical and call for little comment. The radiological findings in the 26 cases where the surgeon found no pathology in the right upper abdomen require some comment. It should be stated that in all these operations the ileocecal region was also explored through the right rectus incision. As already noted, in the 26 negative cases

Fig. 7. X-ray report: Large gallstone. Diagnosis: Gallstone. Operative findings: One large gallstone.

Fig. 8. X-ray report: Enlarged gall bladder containing large gallstone. Diagnosis: Gall-bladder disease and gallstone. Operative findings: Gall bladder thick, white, deformed; contained large gallstone.

Fig. 9. X-ray report: Gall-bladder concavity on duodenal cap. Gall bladder and gallstone shadows in this concavity. Diagnosis: Gall-bladder disease and gallstones. Operative findings: Gall bladder long and thick; contained gallstones.

Fig. 10. X-ray report: Spasticity of duodenal cap and pylorus. Gall-bladder concavity on pylorus. Diagnosis: Gall-bladder disease. Operative findings: Gall bladder reddened and could not be emptied. Cystic duct adhesions.

Fig. 11. X-ray report: Scattered filling in duodenal cap. Gall-bladder concavity on pylorus. Diagnosis: Gall-bladder disease. Operative findings: Diseased gall bladder.

Fig. 12. X-ray report: Irregular duodenal cap. Gall-bladder concavity on pylorus. Diagnosis: Duodenal ulcer, gall-bladder disease, adhesions. Operative findings: Enlarged gall bladder, duodenal ulcer, extensive adhesions between duodenum and gall bladder.

there were found 15 chronic appendices and 20 ileal or cecal bands. These appendices and bands were indicated by X-ray in nearly every case. In addition, tenderness was elicited in the right upper abdomen in 10 cases, and duodenal deformity shown in 10. We are firmly convinced that ileocecal pathology can give rise to these upper abdominal findings. They are spastic phenomena, the sure precursors of the cholecystitis, the bands or adhesions, or ulcer, which will surely follow if the ileocecal pathology is not remedied.

The strongest argument you can employ in urging the surgical removel of chronic appendices and ileocecal bands is the inevitable extension, to these closely allied tissues in the upper abdomen, which will otherwise ensue.

Of the X-ray findings in duodenal ulcer and gastric cancer little need be said.

The classical sign of duodenal ulcer is the irregular duodenal cap. This sign may be obscured, as in 4 cases in this series, by the presence of marked adhesions.

The classical sign of gastric cancer is the filling defect.

The second part of Table II tabulates the X-ray findings in those cases where the surgeons discovered chronically diseased gall bladders, bands, and adhesions. This comprises by far the great bulk of the cases operated upon. The study of these findings has been unusually interesting.

Since gall-bladder disease, either with or without accompanying bands or adhesions, is the predominant finding, the classification we use will be based upon the well recognized signs of gall-bladder disease.

The direct gall-bladder evidence consists of the demonstration on the radiographic film of the shadow of the diseased gall bladder, or of the shadow of gallstones.

In this series the gall bladder was visualized in 67 per cent of the cases in which it was found diseased at operation. Gallstones, curiously enough, were demonstrated in exactly the same percentage of positive cases.

Profiting by the experience of other workers, who, checking up their films after

operation, found shadows of diseased gall bladders and gallstones where they had overlooked them before, we have made a re-examination of the films in which we had missed the gall-bladder pathology. In

Fig. 13. X-ray report: Irregular duodenal cap. Diagnosis: Duodenal ulcer. Operative findings: Duodenal ulcer buried under adhesions.

30 per cent of these negative films we were at the re-examination able to identify the gall bladder or gallstones. In 20 per cent of the films we still could not find the pathology found at operation. In the remaining 50 per cent the fault was with the films. They were not sufficiently clear in detail.

Adding to the findings of the series the additional gall bladders and gallstones found on re-examination, the conclusion is that we can show diseased gall bladders in about 85 per cent of the cases where they are present, and gallstones in about 75 per cent.

These statistics could be improved upon if we had the time to take more than two films of the gall bladder in each case. In a busy clinic, with a large amount of routine work to cover, and the patients not all millionaires, it is not practical to exceed this number of films as a routine procedure,

Fig. 14. X-ray report: Greatly enlarged irregular duodenal cap, evidence of gall-bladder pressure and adhesions. Diagnosis: Duodenal ulcer with adhesions. Operative findings: Duodenal ulcer, gall bladder-liver-duodenal bands. Omental-duodenal-colon adhesions.

and we have all had the experience of taking five or six films of a gall bladder, and finding on the fifth or sixth film the evidence of pathology which could not be discovered in the others.

The view has frequently been expressed that the visualization of the gall bladder may not always be pathognomonic of disease. In this series there were only three cases where we reported the gall bladder visualized on the screen and the surgeon found that organ apparently normal. These bladders were not removed and we consequently have not the help of the pathologist in deciding who was right, the surgeon or

the radiologist. In all the other cases the pathology in the visualized gall bladders was confirmed by the surgeon who removed them and the pathologist who subsequently sectioned them, so that we feel satisfied

Fig. 15. X-ray report: Duodenal cap irregular and enlarged. Adhesions between duodenum and hepatic flexure. Diagnosis: Duodenal ulcer, with adhesions between duodenum and colon. Operative findings: Ulcer on anterior surface of duodenum. Adhesions involving duodenum and hepatic flexure.

that the ability to visualize the gall bladder upon the radiographic film is *prima facie* evidence of cholecystitis.

The indirect evidence of gall-bladder disease consists of the demonstration of the following signs: Tenderness over the gall-bladder area, organic duodenal deformity due to adhesions, spastic deformity of duodenum or pylorus, concave deformity of duodenum or pylorus due to gall-bladder pressure, and hyperperistalsis. In the demonstration of this indirect evidence we have relied chiefly upon the fluoroscope, using the radiograph as a confirmatory measure, or a supplementary method in doubtful cases. These indirect evidences are subclassified, according to whether they occurred in straight gall-bladder disease, in straight bands or adhesions, or in the combination of gall-bladder disease with bands or adhesions. In this way an effort has been made to determine what constitutes a typical sign complex in gall-bladder disease, and what differentiating signs point to the presence of bands or adhesions. A study of the percentages shows that some of the signs are rather characteristic of gall-bladder disease, some are characteristic of bands or adhesions, while some are noncommittal. Tenderness is highly characteristic of gall-bladder involvement, duodenal deformities are more characteristic of bands or adhesions. You will note that in the cases where gall-bladder disease is complicated by adhesions, the percentages are an average of the percentages in gall-bladder disease and bands or adhesions occurring alone; that is, the average of 95 and 65 is nearly 83, while the average of 32 and 68 is exactly 50. Concavity of the duodenal cap due to gall-bladder pressure appears to be characteristic of gall-bladder disease when it is found, although it seems to be somewhat rare. The smallness of the percentage in this series is partly due to the fact that only recently have we been looking specially for it. In bands or adhesions this finding does not occur, while in gall-bladder disease complicated by bands or adhesions, the percentage is increased. This latter finding is due doubtless to the closer approximation of the enlarged diseased gall bladder to the duodenum and pylorus, when compressed by bands or adhesions.

The other indirect signs—spasticity of the pylorus and duodenum, and hyperperistalsis—show no great variation in percentage in the two classes of cases, although spasticity is a more frequent accompaniment of bands or adhesions.

A typical sign complex of gall-bladder disease would seem to be marked tenderness over the gall-bladder area, concavity on duodenum or pylorus from gall-bladder pressure, with moderate evidence of duodenal deformity, spasticity, and hyperperistalsis, while a typical sign complex of bands or adhesions would be marked evidence of duodenal deformity, somewhat marked spasticity of pylorus and duodenum, moderate tenderness and hyperperistalsis, and absence of concave deformity in pylorus and duodenum.

Table III is intended to show the comparative frequency of occurrence of bands and adhesions, to show their relative asso-

ciation with the various viscera in the right upper abdomen, and possibly to draw some conclusions.

Adhesions occurred in 78 cases and bands in 50 cases.

Adhesions most frequently involve the gall bladder (63), and next in order the duodenum (47) and the colon (33). Bands or membranes most frequently involve the duodenum (47). The striking thing is that nearly 50 per cent of duodenal bands (20) run over the duodenum from the lesser omentum to the gastro-colic omentum and do not involve any other viscus. Next in frequency of bands is gall bladder (15) and colon (15). This predominant association of adhesions with the gall bladder and bands with the duodenum, warrants the conclusion that cholecystitis is the commonest source of adhesions and duodenitis the commonest source of bands in the right upper abdomen.

TABLE III, ADHESIONS OR BANDS—DIFFERENTIAL DIAGNOSIS

	Adhesions	*Bands*
Frequency	78 cases	50 cases
Location—		
(1) Gall bladder	63 cases	15 cases
(2) Duodenum	47 cases	47 (alone 20; with G. B., 14; with colons, 13)
(3) Colon	33 cases	15 cases
(4) Omentum	21 cases	0 cases
(5) Liver	19 cases	7 cases
(6) Anterior abdominal wall	12 cases	0 cases
(7) Pylorus	3 cases	3 cases

Commonest association of adhesions
(1) Gall bladder, (2) Duodenum, (3) Colon.
Commonest association of bands
(1) Duodenum, alone, and with other viscera, (2) Gall bladder, (3) Colon.
Conclusion—Gall-bladder disease, greatest source of adhesions. Duodenitis, greatest source of bands.

Another fact brought out by this table, a fact which is not sufficiently emphasized in X-ray literature, is the frequent involvement of the colon—transverse or hepatic flexure—in the bands and adhesions of the right upper abdomen. The colon was involved in adhesions in 33 cases, and in bands in 15 cases. Yet in our X-ray reports this colon involvement was noted in but 6 cases. The reason for this failure to report fully the pathology that was subsequently elicited at operation lies in the failure to have a visualized duodenum while the opaque enema is being given. Recently the writer has frequently given the opaque meal and the opaque enema at the same sitting, and is seriously considering making this a routine procedure.

Note should be made of the fact that bands were not found associated with the omentum or the anterior abdominal wall. By the term "omentum" here is meant that portion which constitutes the free apron.

TABLE IV, ASSOCIATION OF DISEASE IN RIGHT UPPER ABDOMEN WITH ILEOCECAL DISEASE

Operative findings

A. Chronic cholecystitis
Bands or adhesions in right upper abdomen } 128 cases
Both
were associated with
B. Chronic appendicitis (46) } 95 cases
Ileocecal bands (68)

Conclusion:
75 per cent of right upper abdominal pathology is associated with ileocecal disease.

Table IV is an attempt to determine the relation between disease in the right upper abdomen and disease in the ileocecal region. Originating as do the ileocecal structures, the gall bladder and the pyloric-duodenal junction, from the same fetal tissue, it is reasonable to expect that disease in one of these will quickly be followed by disease in the others. As a matter of fact, that is what actually happens. A vicious circle becomes established, involving these three regions. This series of cases emphasizes that fact. As stated previously, the surgeons, using the right rectus incision, explored the ileocecal region at every operation upon the right upper abdomen. In this series there were 128 cases in which the lesion in the right upper abdomen was chronic cholecystitis or bands or adhesions or some combination of these. In 95 out of these 128 cases there was found concurrent disease in the ileocecal region—chronic appendicitis in 46 cases, and ileal or cecal bands or adhesions in 68 cases. Seventy-five per cent of right upper abdom-

inal pathology is associated with ileocecal disease.

The distribution of bands and adhesions in the ileocecal region is interesting. Seventy-five per cent of the adhesions involved

Fig. 16. X-ray report: Large irregular duodenal cap. Greatly over-visualized second portion of duodenum. (This patient had had gall bladder removed elsewhere, without relief from symptoms.) Diagnosis: Duodenal ulcer, marked adhesions. Operative findings: Duodenal ulcer, marked adhesions between duodenum and liver.

the appendix, and only 25 per cent the ileum or cecum. In the latter the adhesions were usually to the scar of an old operation. Conversely, the appendix was found involved in bands infrequently as compared with the banding found about the terminal ileum, cecum and ascending colon. The appendix is, in this respect, analogous to the gall bladder, and the ileum and cecum to the duodenum. Appendix and gall-bladder disease, being primarily inflammatory in character, makes its main point of attack at the immediate site of the organ and expresses itself in adhesions. Duodenal, ileal and cecal disease, while also inflammatory in character, has that inflammatory reaction grafted on to a developmental abnormality, and expresses itself in bands.

CONCLUSIONS

1. The order of frequency of right upper abdominal disease is: First, the gall bladder; second, bands or adhesions; third, the duodenum. These are closely interrelated in their pathological processes.

2. The gall bladder and the appendix are the commonest sites of adhesions, the duodenum and the ileocecum the commonest sites of bands.

3. X-ray signs in a normal right upper abdomen may be produced reflexly from ileocecal disease.

4. The gall bladder can be visualized on the radiographic film in at least 85 per cent of the proved cases, and gallstones in 75 per cent.

5. We believe the visualized gall bladder is always pathological.

6. The indirect evidences of gall-bladder disease (tenderness; deformity of duodenum due to adhesions, spasm or gall-bladder pressure; hyperperistalsis) are good for 100 per cent value in diagnosis. The presence or absence of adhesions can be determined by variations in the grouping of this sign complex.

7. Disease in the right upper abdomen is intimately associated with ileocecal disease, a fact that should not be lost sight of when recommending lines of surgical procedure.

THE STUDY OF TUMORS OF THE BLADDER BY MEANS OF PNEUMO-ROENTGENOGRAPHY[1]

By G. E. PFAHLER, M.D., PHILADELPHIA, PENNSYLVANIA

ON May 8, 1919, I presented a paper[2] upon this subject before the Philadelphia Roentgen Society, but I had been using this method in my roentgen examinations for ten years previously, and had frequently referred to the method at medical meetings during this time. I am showing you some slides which were made in 1911. It seemed such a rational procedure that I presumed that it was used rather generally. I do not find the method recommended, however, in the leading text-books, and it is surely not in general use. I am convinced of its great value, and therefore I take this opportunity of bringing it to your attention.

I have studied about a hundred cases, and in only a few of these was a pneumo-roentgenogram requested,—I think chiefly because the method is not generally known. In nearly all of these cases the patient was sent for an X-ray examination of the kidneys, ureters or bladder for urinary calculus, and when I suspected a carcinoma, or when such a diagnosis had been made, I made a pneumo-roentgenogram.

Cystoscopy has been developed to such a high degree that physicians probably have not felt the need of this modified roentgen method of diagnosis of conditions within the bladder. There are, however, many cases in which an examination by the cystoscopist is not practical for one of the following reasons:

1. Because of the severe pain which often accompanies a cystoscopic examination;
2. Because of inability to pass the cystoscope;
3. Because of severe hemorrhage which quickly clouds the fluid and interferes with vision;
4. Because of decided objections on the part of the patient;
5. Because a cystoscopist is not always at hand.

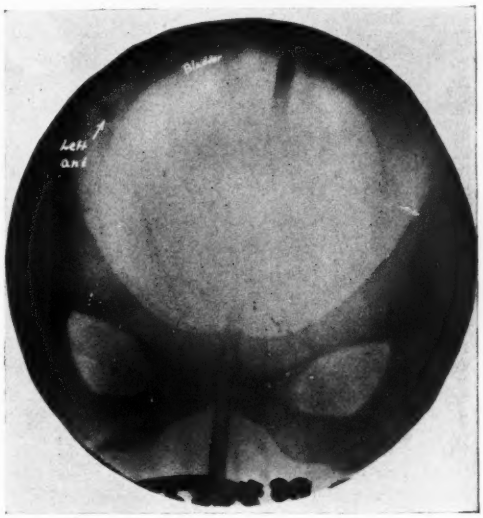


Fig. 1. Normal bladder. Examination made to determine the relation of the calcareous body located outside of the bladder, on the left side. Note the smooth, perfectly flexible bladder wall, and note the relations to the pubes and the obturator foramina.

TECHNIC

It is my custom to make an anterior and a posterior film of the bladder before attempting an injection of air. These films will demonstrate the conditions as they exist independent of the existence of air. In such films one may recognize the air and gases which may be retained in the rectum or pelvic colon. One may also recognize the presence of a urinary calculus or prostatic calculi, or phleboliths in the pelvis, all of which are more clearly demonstrated after the injection of air. It is always an advantage to have the rectum empty. The urethral orifice is then cleansed in the usual manner necessary for catheterization. A

[1]Illustrated by lantern slides, and presented by invitation before the Philadelphia Urological Society, Nov. 26, 1923.

[2]Am. Jour. Roentgenol., Aug., 1919.

soft rubber catheter is then chosen according to the conditions present, utilizing the largest size that will pass without severe pain or inconvenience. An atomizer bulb and its rubber tubing is then attached to a

Fig. 2. A large tumor involving chiefly the left side of the bladder, with infiltration about the urethra. Note that the remainder of the bladder wall is smooth and flexible and that even on the left side, part of the bladder wall is flexible, as is indicated by the smooth outer border, the tumor surrounding the region of the left ureter. Note the irregularity of the tumor and the broad base, which is a sign of malignancy.

piece of glass tubing, so tapered that it can be inserted easily into the rubber catheter. This glass tubing and catheter should, of course, be sterilized.

An extra precaution against the injection of germs from the air into the bladder consists in utilizing a glass tubing which is wide at one end, into which can be inserted a plug of sterile cotton; this will filter the air to a certain extent during the injection. I believe the danger of injecting germs from the air is not serious, for ordinarily they would not find a suitable culture medium and would probably be dealt with in the bladder without doing harm. These cases are usually infected before coming for examination and are passing pus and blood rather freely. However, we can avoid criticism by taking every possible precaution.

The catheter is passed into the bladder. Generally one finds considerable residual urine. This is removed, and the bladder is compressed until one has eliminated, so far as possible, all of the fluid in the bladder.

Fig. 3. Two tumors with extension into the surrounding tissue, with a secondary nodule above the first one on the right side. Note regularity in outline and broad base, confirmed at operation.

Air is then injected or compressed into the bladder by means of the atomizer bulb until the patient complains of distress, distention or desire to urinate. If the compression is done slowly with the thumb and first two fingers, and due attention is paid to the complaints of the patient, I believe no harm can be done. I do not know of any such result, but one should keep in mind the possibility of over-distending or even rupturing a diseased bladder by this process. Generally one can outline the distended bladder by percussion.

When the bladder is fully distended, a pair of hemostatic forceps are clamped over the soft rubber catheter and then fastened to the thigh by means of adhesive plaster. The atomizer bulb and glass connecter are removed. With the patient lying on his

back upon a Potter-Bucky diaphragm, we then make two films, using a soft tube so as to preserve detail. The patient is then turned upon the abdomen and two more films are made, directing the central ray through the bladder obliquely forward and upward so as to project the sacrum and coccyx above the field of study.

Generally the anterior view will give most information, but occasionally in rolling the patient over the air will be expelled; therefore, I never fail to make the posterior films first. The two positions give confirmatory evidence.

If, by any chance, the catheter comes out it must be reinserted to withdraw the air, or the patient will have considerable discomfort. As soon as the examination is completed, the patient is turned upon the back, the clasp is removed from the catheter and the air is expelled. Generally it is advisable to compress the bladder in the suprapubic region, which will assist in the expulsion of the air.

Up to the present time, during the past fourteen years, I have had no trouble connected with the injection of the air, or from retention of the air. There has been no serious objection or discomfort on the part of the patient, nor any bad after-effects. In one case, I was unsuccessful in passing a soft rubber catheter, and attempted to pass a silver prostatic catheter. I thought I did it very carefully and very gently, but I was unsuccessful, and later in the day the patient had some hemorrhage and had complete retention of urine. A silver catheter is objectionable, too, because the patient cannot turn upon the abdomen.

INTERPRETATION

A normal bladder will show an outline of gas, usually circular in outline and with perfectly smooth walls. As one might expect, therefore, the normal bladder wall, in case of a tumor, will also be shown by a smooth outline as compared with the irregularity of the portion that is diseased. The tumor will be shown by a solid body or mass projecting into the transparent air-containing cavity. The appearance of this tumor will vary with its size, shape and general character. So far, I have had the opportunity or experience of finding only one benign tumor. This benign tumor was

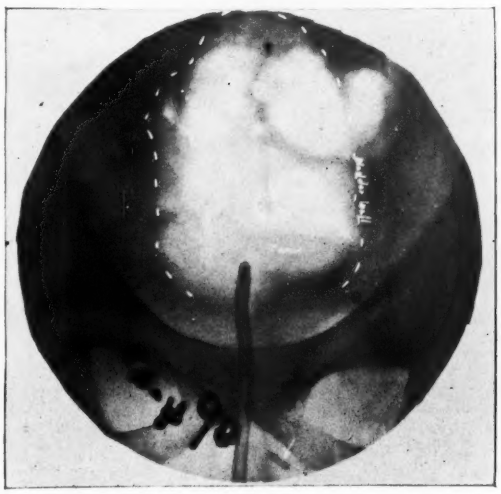


Fig. 4. Tumor involving the lower and right bladder wall, with irregular infiltration. An examination was made and operation by Dr. LaPlace and the writer, doing electrocoagulation through a suprapubic cystotomy, on April 18, 1916. This was the first case in which the writer did electrocoagulation on a tumor in the bladder.

about 2 cm. in diameter, globular in outline, and did not present a broadened base.

The carcinomas may be globular in outline, or flat and irregular, but in my experience they have all had a broader base than any other sort of tumor. Generally, the tumor looks bigger than one finds upon opening the bladder. This is likely due to infiltration of the wall about the base of the carcinoma, the infiltration interfering with the stretching or distention of the affected portion of the bladder wall. At times, this tumor has been located directly over the prostatic area, while at other times it has involved the lateral or upper wall. In a few cases the tumor has seemed to fill nearly the entire bladder. One cannot definitely decide whether the tumor is malignant or not. Neither can one decide positively by the cystoscope. One must judge by the

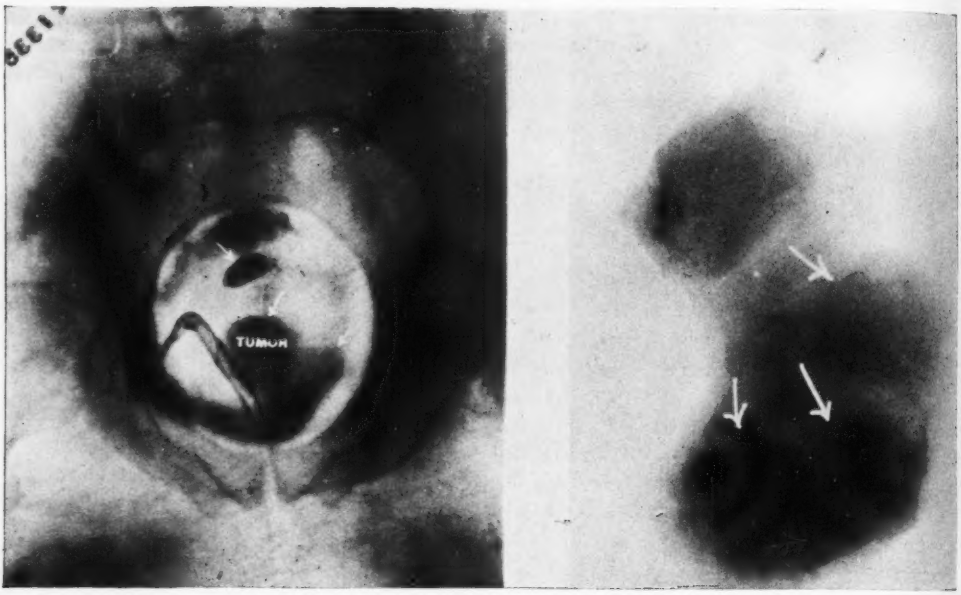


Fig. 5. Vesical calculus, with a fibroid tumor. The tumor was removed by Dr. B. A. Thomas and is shown on the right-hand side of the illustration.

size, position and general outline. If the tumor is large, occurs in an older patient and is irregular in outline, especially if it presents a broad base, one would think first of malignancy. If it is small, smooth and pedunculated, one would think first of a benign growth.

Whether the growth is benign or malignant, the only chance a patient has for recovery consists in its removal, by electrocoagulation through the cystoscope if it is small, by electrocoagulation through a cystostomy, with the implantation of radium needles, by excision or thermo-cautery, by means of direct application of radium, or by treatment with the high voltage X-rays through the abdominal walls. In any of the above methods of surgical removal a section of the growth can be examined microscopically after its removal.

Since there is a tendency for all benign growths to become malignant later, it is surely advisable to treat them as malignant in their earliest stages, leaving nothing undone that would be of value in the destruction or elimination of the growth if it were known to be malignant.

In addition to making a diagnosis, this definite information as to size and position will be useful in planning, and at times in performing, the operation. If the patient is treated only by the X-rays or radium, one can make examinations at intervals to observe the improvement or disappearance, as I shall show you in some lantern slides.

Enlarged prostate can usually be palpated, and such an examination as I have described is not necessary, but is often an advantage. One can demonstrate the projection into the bladder. If the tumor is smooth and regular in outline and uniformly dense, one would think it a benign enlargement of the prostate. If the upper or anterior surface of the prostate is irregular in outline or the enlargement involves especially one lobe, one would think of a malignant infiltration, and especially if this shows extension beyond what is ordinarily recognized as the prostatic area.

Diverticula of the bladder can also be demonstrated in this manner, if they occupy the lateral wall. Rectal gas is, however, apt to be confusing. Generally the injec-

tion of an opaque solution into the bladder will give a better outline of a diverticulum, and will serve to differentiate it from the gas in the rectum. The injection of the opaque solution can follow immediately after the expulsion of the air. The injection of an opaque solution is not of much value for demonstrating the outline of a tumor of the bladder, because the opaque solution will cover up the outline excepting when it is located on the lateral wall.

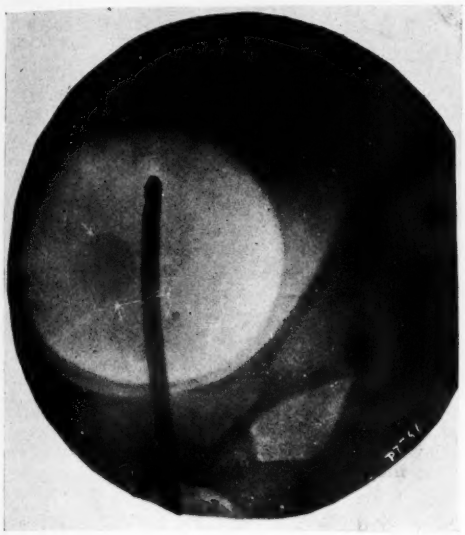


Fig. 6. Examination made February 10, 1914, for Dr. H. C. Deaver, shows small benign tumor which was destroyed by Dr. William H. Mackinney, through the cystoscope.

Calculi in the bladder can be more clearly demonstrated by pneumo-roentgenography, and calcareous bodies outside the bladder can at times be differentiated by this means.

General thickening of the bladder walls, as from tuberculosis in children, can be demonstrated.

I have had the opportunity of examining about one hundred cases of tumor of the bladder, and of demonstrating some sixty lantern slides, showing a great variety. For the sake of brevity, I will not give detailed reports but will publish a few illustrations. Nearly all cases have been operated upon and in all of those that came to operation the X-ray findings were confirmed.

Fig. 7. Thickened bladder wall in a child, believed by Dr. Mackinney to be tuberculous.

CONCLUSIONS

1. Injection of the bladder with air is practical and with proper precautions is harmless.

2. Tumors can be definitely outlined, and when judged by their size, shape, and general character, in conjunction with the clinical history and symptoms, a diagnosis as to their nature can generally be made.

3. Pneumo-roentgenography can be used when for some reason a cystoscopic examination is impossible or impractical on account of the field being partly obscured by blood.

4. It is less painful and generally less objectionable to the patient than the cystoscopic examination, and can be carried out wherever there is an expert roentgenologist.

5. Observations of progress during the treatment of carcinoma of the bladder by radiation may be made from time to time by this method.

THE SEEMANN SPECTROGRAPH [1]

By OTTO GLASSER, Ph.D., Cleveland Clinic, CLEVELAND

EVER since the discovery of the deflection of X-rays within the atomic structure of crystals, X-ray spectroscopy has developed to a remarkable degree. Among the various methods of spectroscopy which have been developed by many investigators, Seemann's pin-hole camera method has been of especial value, not only because of its general application to roentgen-ray spectroscopy but also in the determination of dosages in X-ray therapy. Since I have had some experience in the use of this spectrometer it is my purpose to offer a brief description of the instrument and its use. Detailed information regarding this spectrograph can be found in the numerous publications by Seemann himself.

A diagram and photograph of the Seemann spectrograph are given in Figure 1, the photograph showing the smaller type of spectograph usually used in the treatment room. The X-rays from the tube are so directed as to strike a rock salt crystal contained in the lead glass tube, E. Within the atomic structure of the crystal the X-rays are deflected according to their wave lengths and their angles of incidence by a slit diaphragm formed by a sharp lead wedge. In a fixed position this slit permits rays of only one wave length to pass. Thus by turning the crystal around the axis, D, which governs the position of the slit, only such rays as have corresponding angles of incidence can pass the slit. Each of these different rays falls on a different part of a photographic film in the lead-protected container, A, after it has passed through the tube, B. A clockwork driving mechanism, C, oscillates the instrument, the range of movement being controlled by the curve arrangement, RU. By means of two sights, V and W, and the set screws S_1 and S_2 the instrument is adjusted and focused. Diaphragms with any kind of filter, either solid or liquid, can be passed into the path of the rays through slits provided for this purpose. Various conditions govern the time of exposure, which may be from 5 to 60 minutes.

In Figure 2, seven spectra made with the Seemann spectrograph are shown, Nos. 1, 5 and 6 having been made by Dr. Seemann from rays from German transformers, the remainder being made from rays from a tube operated by American machines. These spectra show, superimposed upon the well-known heterogeneous continuous spectra, the characteristic homogeneous rays, K_β and K_α lines, first and second order of a tungsten resp. platinum and tantalum target, as indicated in the description of each spectrum. These spectra may be practically employed for the determination of the minimum wave lengths and by means of the Planck-Einstein formula, together with a superimposed Ångstrom unit scale, the corresponding voltage of the tube may be determined to an accuracy of within about 5 per cent. This application of the Ångstrom scale is shown in Spectra III and IV. A still greater accuracy in the measurement of this minimum wave length can be secured by the photometric method, which will be mentioned later.

Furthermore, by means of these spectra we can judge the effect of absorption on the intensity of the different wave lengths and can determine the wave lengths of characteristic rays. We can judge the intensity of the rays by comparing the different degrees of darkening of the photographic film, provided the conditions of exposure, film, developer, etc., have been exactly the same. The seventh spectrum, in which the rays from an American and from a German transformer have been recorded on the same film under exactly the same working conditions, illustrates this point.

The use of a photometer for measuring the degree of darkening of the different wave lengths in the film makes it possible

[1] Read at Annual Meeting of Radiological Society of North America, Rochester, Minn., Dec. 3-7, 1923.

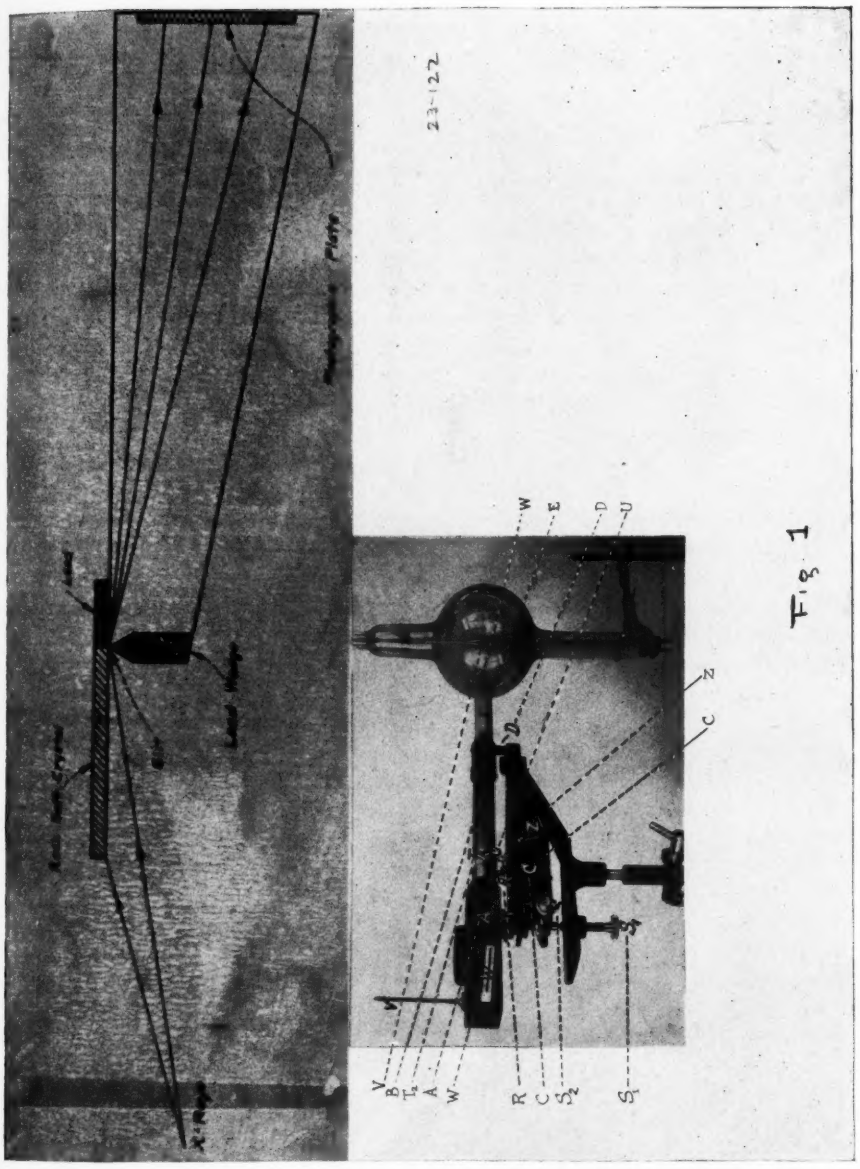
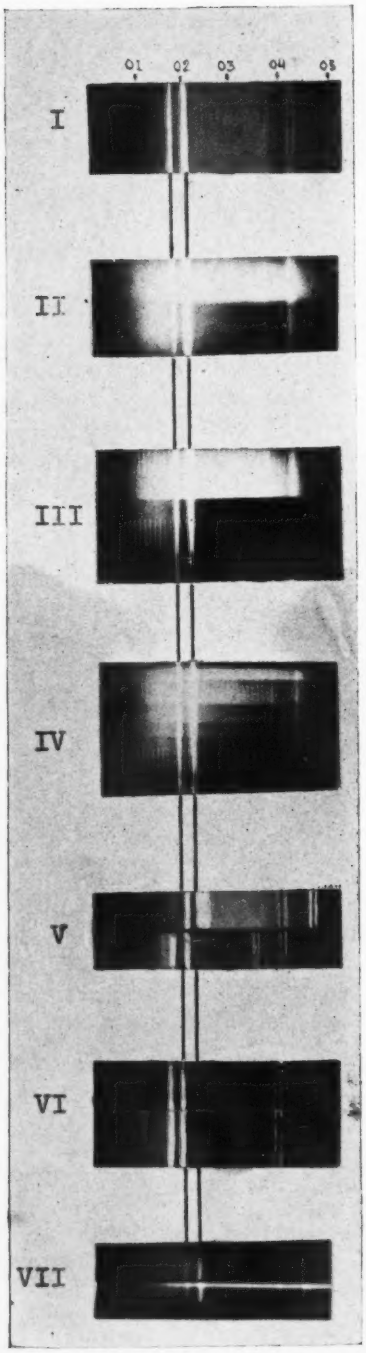


Fig. 1. Seemann spectrograph.

to judge more accurately the intensity-distribution within the spectrum. The curves shown in Figures 3 to 5, for which I wish to express my indebtedness to Prof. P. P. Koch and Dr. R. Blunck, were made with the mikrophotometer of the Hamburg Physical State Institute. In Figure 3, Spectrum III of Figure 2 is shown with the corresponding photometer curves for the unfiltered rays and for the rays filtered through 1 mm. copper. Distribution of the wave lengths can be read accurately and, to a certain degree, the intensity of the different wave lengths. The abscissæ represent the wave lengths in AU, the ordinates, the intensity in certain arbitrary units.

Figure 4 shows the intensity curves for six different spectra (Fig. 2, IV), recorded

X-RAY SPECTRA
Fluctuating Voltage



Å U

I — 90 KV. Unfiltered, Tungsten Target

II — Unfiltered, ¼ mm. Cu. } 200 KV., Tungsten Target

III — Unfiltered, 1 mm. Cu. } 200 KV., Tungsten Target

IV — Different Filters } 200 KV., Tungsten Target

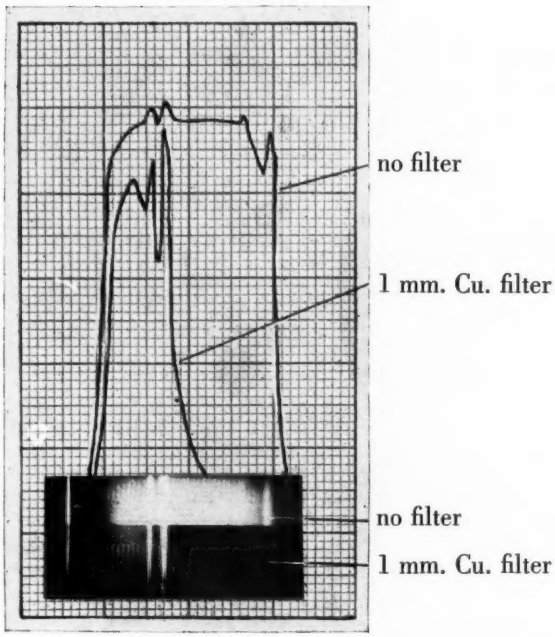
V — Tantalum Target, Platinum Target } 100 KV.

VI — 1 mm. Lead Glass Filter, 2 mm. Copper Filter } 130 KV., Platinum Target

VII — Two Different Transformers } 200 KV., Tungsten Target

Fig. 2. Spectra made with Seemann spectrograph.

X-RAY SPECTRA



TRANSFORMER. Fluctuating Voltage
200 KV. (Peak) Tungsten Target

Fig. 3. Seemann spectrum with corresponding photometer curve.

on one film with the same time of exposure. A study of these spectra reveals the amount of radiation cut out by various filters, the high intensities of the characteristic lines, etc. The law governing the exact intensity distribution within the spectrum as recorded by the darkening of the film for different wave lengths, is not yet known, although some results of investigations in this field have been published recently. However, the principle involved may be shown by a comparison of the ionization spectra curves with the curves made from the photographic recording spectrograph, as in Figure 5, in which a Duane ionization spectrum is shown with a Seemann photographic spectrum. This comparison cannot be exact as the working conditions of the transformers in the two cases were not identical, but the differences in principle are apparent.

SUMMARY

The Seemann spectrograph is a very simple and practical instrument by which the entire X-ray spectrum can be obtained on a photographic film. The wave length distribution and to a certain degree the intensity of the different wave lengths can be determined by the spectrum thus obtained. A method of securing a higher degree of accuracy in the measurement of these photographic intensity-distributions is still to be developed.

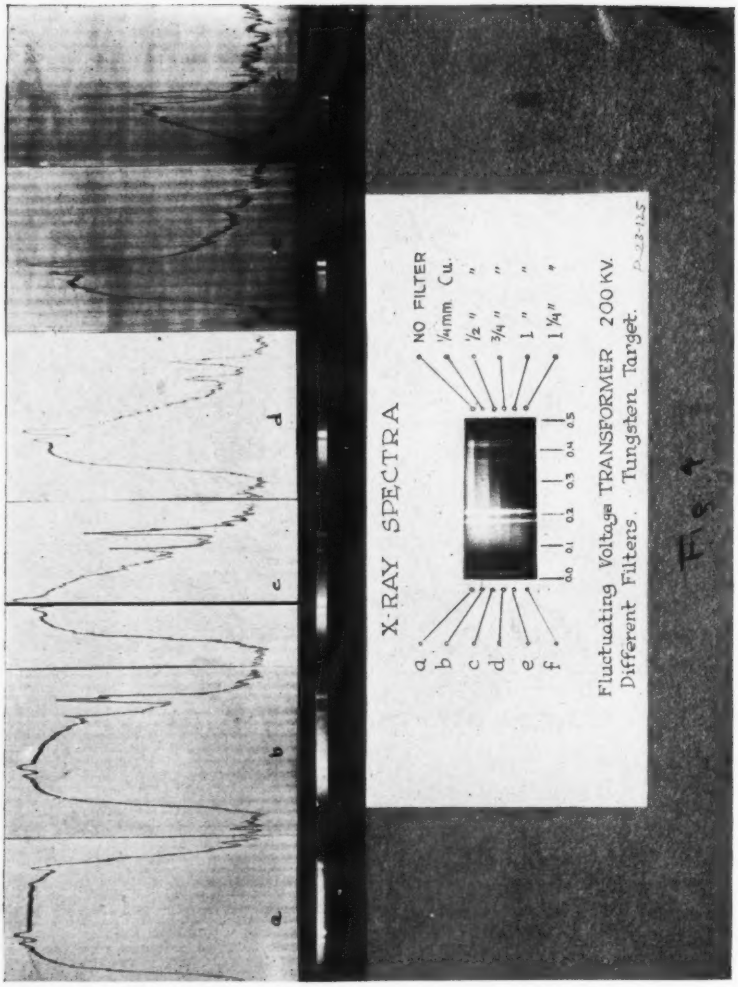


Fig. 4. Single film showing six X-ray spectra with corresponding intensity curves.

Carcinoma of the esophagus.—Carcinoma of the esophagus, up to the present time, has been fatal in practically 100 per cent of cases. There are obvious reasons for this, and the histologic type of growth indicates that it is extremely resistant to any form of treatment, even in the most accessible locations. The treatment should always be considered palliative, and adhere to those methods or combinations of methods which give most relief with least risk and discomfort to the patient.

The plan of combining early gastrostomy with radiation, chiefly high voltage roentgen rays, has given the best results, in the author's experience. The benefits of an early gastrostomy are so impressive that the author now urges and insists upon it in all cases at the outset, even though the obstruction is slight. The benefit is not only in the facility provided for adequate feeding, but the swallowing improves after a period of rest to the esophagus. There is no question but that the mechanical irritation of constant and

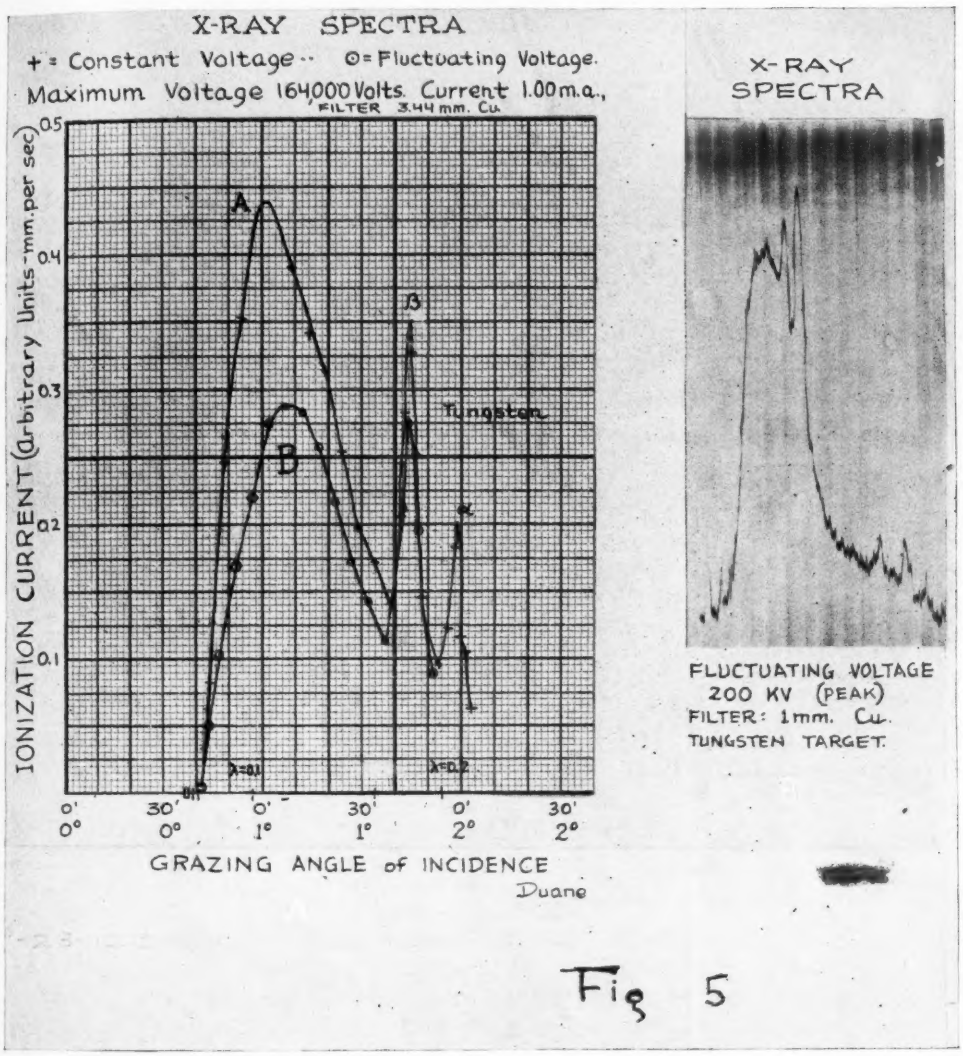


Fig. 5. Ionization spectra curves from, A, Duane ionization spectrum, B, Seemann photographic spectrum.

forced efforts at swallowing increases the rate of growth, as well as the incidence of local mixed infection.

The author believes that earlier gastrostomy plus more intensive high voltage roentgen radiation will in the future give a longer period of palliative relief.

J. D. CAMP, M.D.

Some Considerations in the Treatment of Carcinoma of the Esophagus. Douglas Quick. Am. Jour. Roentgenol. and Rad. Ther., May, 1924, p. 383.

The new officers of the American Radium Society, elected at the Chicago meeting in June, 1924, are as follows: President-elect, Douglas Quick, M.D., New York; First Vice-president, Albert Soiland, M.D., Los Angeles; Second Vice-president, Ernest C. Samuel, M.D., New Orleans; Secretary, Edwin C. Ernst, M.D., St. Louis; Treasurer, R. E. Loucks, M.D., Detroit; Member Executive Committee, James T. Case, M.D., Battle Creek.

THE VALUE OF THE GRANGER LINE IN THE DIAGNOSIS OF DISEASE OF THE SPHENOID SINUS, WITH ILLUSTRATIVE CASES[1]

By AMEDEE GRANGER, M.D., New Orleans, La.

Officier d'Académie (France); Director, Roentgen-ray Department, Charity Hospital; Professor of Radiology, Post-graduate Medical School of Tulane University

LAST year, the writer described (1) in detail the boundary landmarks of the sphenoid sinus and the ethmoidal cells seen in radiographs of skulls and heads held in his alveola-glabella position on 107° and 23° angle blocks, respectively. (Fig. 1.)

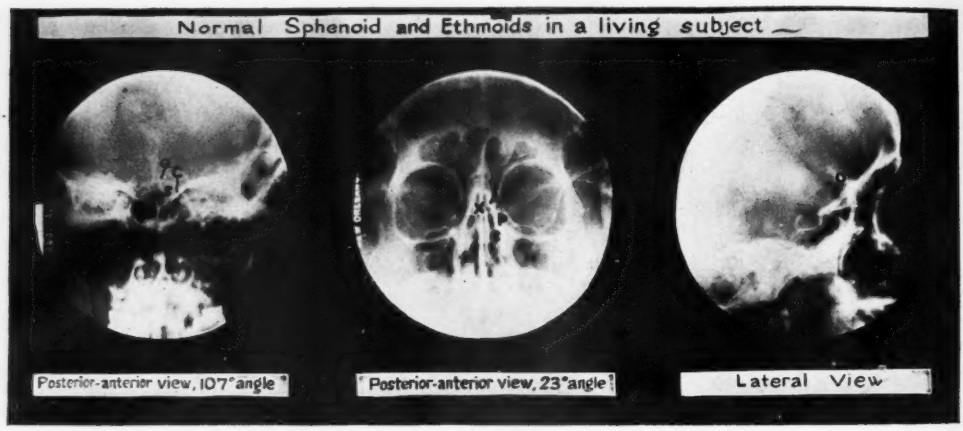

Normal Sphenoid and Ethmoids in a living subject
Posterior-anterior view, 107° angle
Posterior-anterior view, 23° angle
Lateral View

Fig. 1.

Experiments with filled skulls and practical work in a large radiological clinic proved that with this position it was possible to make exact duplicate radiographs of the same skull or head, and strikingly similar radiographs of very different shaped ones (2).

Believing that it would be both important and interesting to determine positively what anatomical structures produced the line-shadows mentioned above, other radiographs were made before and after attaching pieces of fine lead wires to predetermined parts of a dried skull.

These radiographs (Fig. 2) show that the Granger line (*G*) is produced by that portion of the upper surface of the sphenoid bone called the optic groove, and the line *C* is produced by the cerebral or inner plate of the orbital or horizontal portion of the frontal bone. Up to this time, the writer believed with other roentgenologists that this *C* line was produced by the lesser wing of the sphenoid. He found out that such was not the case when a radiograph, made after removing the lesser wing of the sphenoid on one side of the skull, showed the *C* line still present on both sides.

The line *X* is produced by the posterior edge of the floor of the anterior cerebral fossa. (Fig. 3.) The line *O* is produced by the greater wing of the sphenoid. (Fig. 4.)

The line *T*, seen occasionally, is produced by the floor of the sella turcica (Fig. 2), and the line *W* is produced by the edge of the greater wing of the sphenoid. (Fig. 3.)

The line *O* forms the anterior boundary of the sphenoid sinus; the line *X* the upper boundary of the sphenoid in the 23° angle

[1] Read before the Radiological Society of North America, Rochester, Minnesota, December, 1923.

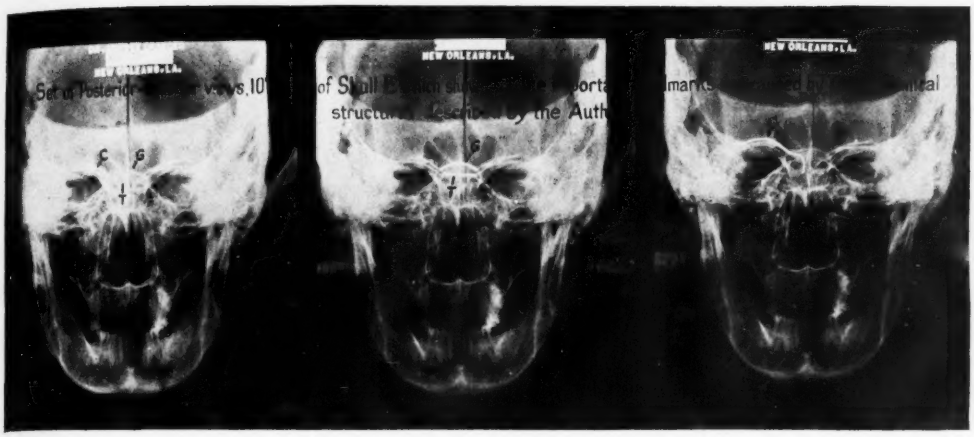


Fig. 2.

view; the line *C* the upper boundary of the ethmoidal cells, and the line *G* the upper boundary of the sphenoid in the 107° angle view.

It has already been pointed out that the line *G* is the most important of these lines (3). By a careful study of this line and of the subjacent area, the sphenoid region, included between the lines *G* and *C*, the writer has been able to determine whether the sphenoid sinus was diseased or not, and when diseased, to state with a degree of accuracy impossible up to this time, that it contained pus, polypi, or hyperplastic tissue.

When studying this curved line *G* one must note carefully,—

(1) If it is seen on both sides of the median line.

(2) If the line is clear with well-defined outline throughout its entire course, or if it is thicker and more distinct, or thicker but less distinct, or irregularly broken or hazy, or so faint as to be hardly visible, on one or both sides.

(3) If it is absent, whether absent on one or both sides.

(4) If the subjacent sphenoid region is slightly dense, dense or very dense on one or both sides.

Brief histories (with accompanying radiographs) of a few cases will suffice to demonstrate the practical clinical value of the *G* line, just as the striking similarity of these radiographs (the pathological findings excepted, of course), made of the heads of patients of different ages and races, will demonstrate the superior advantage of the alveola-glabella position.

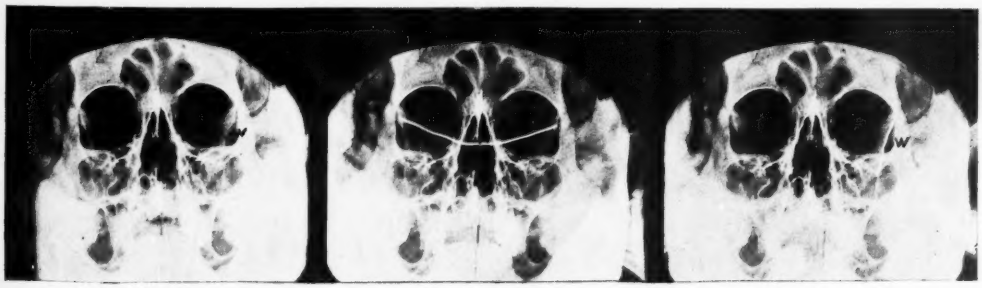


Fig. 3.

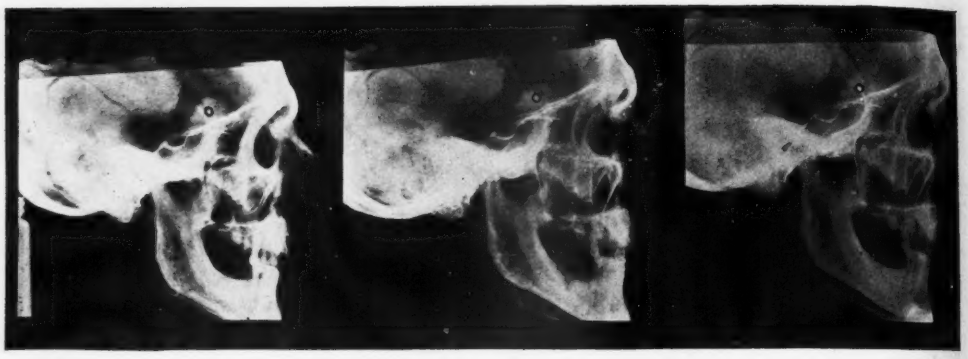


Fig. 4.

HISTORIES

Normal Sphenoid Sinus.

Radiograph (Fig. 5): The *G* line is clear, with well-defined outline on both sides, and both sphenoid regions are of uniform and normal density.

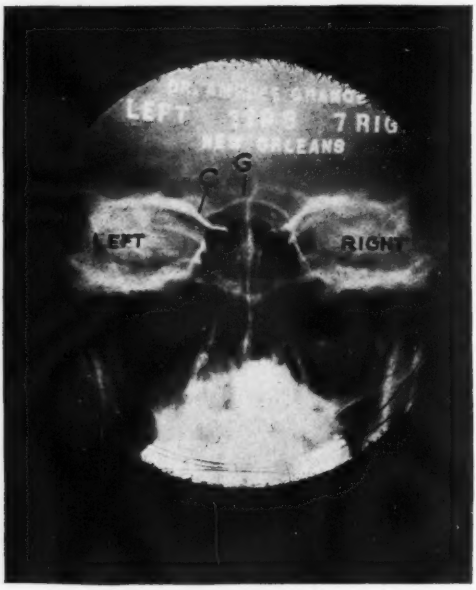


Fig. 5.

Vacuum Sphenoid Sinus on the Left Side.

Dr. C. H. For four years this patient had had attacks of violent rhinitis with the most terrific pains, mostly referred to the left orbital region, recurring at intervals of ten days or two weeks and lasting for about 72 hours. In April, 1920, a submucous resection was done, and in March, 1923, Dr. R. C. Lynch cauterized the left middle turbinate with trichloracetic acid. After the cauterization, the breathing through the left naris was much improved, but the attacks did not subside. In fact, they began to occur following the slightest exposure and the left orbital pain increased in violence.

Radiograph (Fig. 6): The *G* line is so faint that it can hardly be made out on the left side, and the left sphenoid region is slightly dense. *Radiological diagnosis:* Thin pus or fluid in the left sphenoid sinus. *Operative findings:* Dr. Lynch found a vacuum sphenoid, which he washed out. The washings contained shreds but no pus. *After-results:* Three weeks following this operation, Dr. C. H. wrote, "I have gained in weight and strength, and feel like a different man, since we washed out the sphenoid. It is almost beyond my conception that such a small thing could make such a difference."

Left Polypoid Sphenoiditis.

Mrs. J. A. B. Clinical diagnosis was chronic ethmoiditis and sphenoiditis with polypoids on the left side. Radiograph (Fig. 7): The *G* line is absent on the left side and the left sphenoid region is very

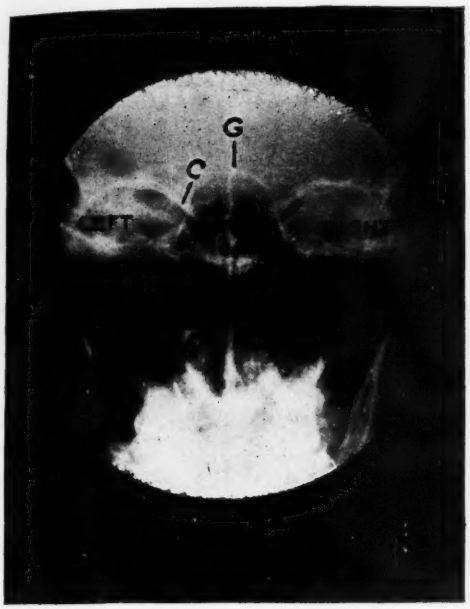


Fig. 6.

dense. The convex upper border of the dense sphenoid shadow is continuous with the *G* line on the right side. The ethmoidal region is very dense on the left side. *Radiological diagnosis:* Left polypoid sphenoiditis and ethmoiditis. *Operative findings:* Dr. R. C. Lynch performed a double ethmoidectomy and opened the left sphenoid sinus, from which he removed polypi.

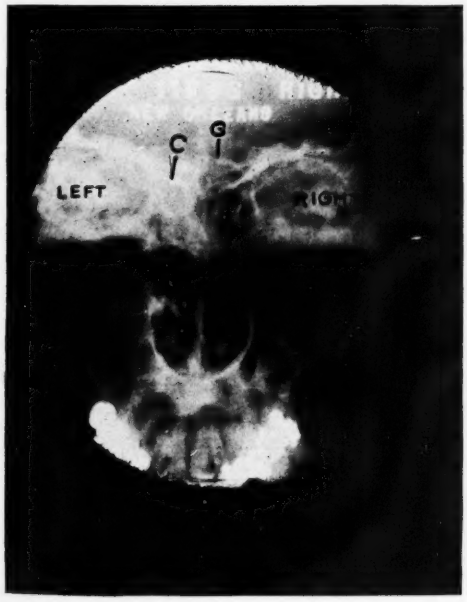


Fig. 7.

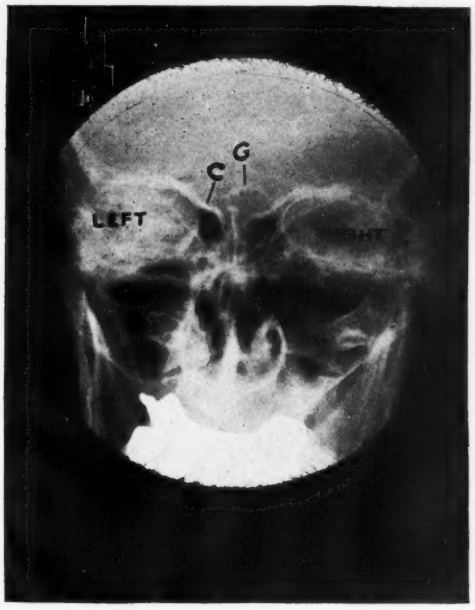


Fig. 8.

Empyema of the Left Sphenoid Sinus.

Mrs. W. McK. This patient was under treatment for a chronic ethmoiditis on the left side, when the increasing severity of the head pains caused Dr. R. C. Lynch to suspect that the left sphenoid sinus had become involved also. Radiograph (Fig. 8): The *G* line is absent on the left side and the left sphenoid region is dense. *Radiological diagnosis:* Empyema of the left sphenoid sinus. *Operative findings:* Dr. Lynch washed a quantity of pus from the left sphenoid sinus. *After-results:* The head pains disappeared after the first washing and the infection cleared up after a few more washings.

Empyema of the Left Sphenoid Sinus.

Dr. J. M., a prominent oto-laryngologist of New Orleans, has been suffering with recurrent attacks of infectious arthritis for the past ten years. Practically all his joints have been involved at some time or other.

Fig. 9.

Fig. 10.

At various times, in the hope of eradicating the foci of infection, his tonsils were removed, nearly all his teeth were extracted, a radical antral operation was performed on the left side and the naso-antral opening was enlarged on the right side. The attacks, although very severe and painful, were promptly relieved each time by one of the surgical procedures mentioned above.

In November, 1922, he had a severe attack of arthritis in both knees. Pus was washed from both his antra, and after a few days he was able to get about on crutches with pain and difficulty, but, the arthritis not clearing up as it had done on previous occasions following similar treatment, he was referred to us for a radiological examination of the para-nasal sinuses. Radiograph (Fig. 9): The *G* line is absent on the left side and the left sphenoid region is dense. *Radiological diagnosis:* Empyema of the left sphenoid sinus. *Operative findings:* Dr. Taquino washed pus from the left sphenoid sinus. *After-results:* The arthritis rapidly cleared up. After a few more washings the arthritis disappeared entirely and he was free of attacks until October, 1923, when his spine became very painful and stiff. Another radiograph showed the *G* line absent and the sphenoid region dense on the left side. More pus was washed from his left sphenoid and the pains and stiffness in his spine disappeared after three or four days.

Right Polypoid Sphenoiditis.

Colored girl, eighteen years old. A clinical diagnosis of chronic ethmoiditis, with polypi, on the right side was made because of the presence of polypi in the middle meatus and on the middle turbinate on that side. Radiograph (Fig. 10): The *G* line is absent on the right side and the right sphenoid region is very dense. The convex upper border of the dense sphenoid shadow is continuous in the median line with the *G*

line on the left. The right ethmoidal region is very dense. *Radiological diagnosis:* Right polypoid sphenoiditis and ethmoiditis. *Operative findings:* Dr. Estopinal removed the right middle turbinate, exenterated the ethmoidal cells, and removed some polypi from the sphenoid sinus.

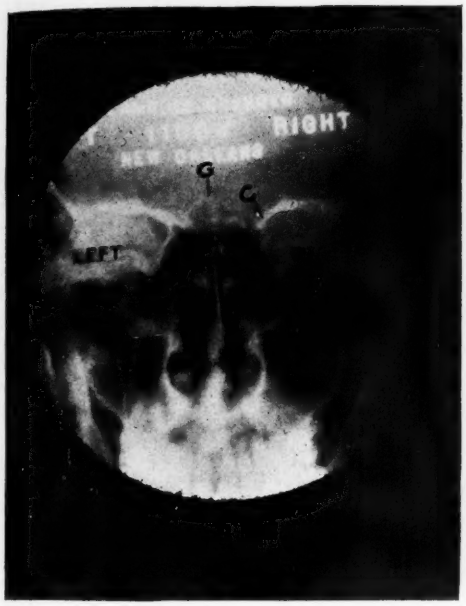


Fig. 11.

Right Hyperplastic Sphenoiditis.

Mr. F. T. R., a sufferer from bilateral chronic maxillary sinusitis, began several weeks previous to examination to have severe pains in the right eye, and in the back of the head and neck. Radiograph (Fig. 11): The *G* line is thicker, with hazy, irregular outline on the right side, and the right sphenoid region is dense. *Radiological diagnosis:* Right hyperplastic sphenoiditis. *Operative findings:* Dr. Taquino found the sphenoid opening narrowed. The washings from the sphenoid contained a few shreds, but no pus. *After-results:* The pains in the eye, head and neck disappeared after the washings.

Acute Empyema of the Left Sphenoid.

S. J., colored boy, eleven years old. Admitted to the Charity Hospital with the left eye greatly swollen and bulging. There was no discharge from the eye. A small tender swelling, about the size of a cherry, was present on the left side of the nose near the eye. The nose was swollen and tender, especially the upper portion near the forehead. There was no discharge from the nose, but the left nostril felt full and closed. He had severe headache and temperature of 102°. A diagnosis of acute ethmoiditis with the probability of an acute sphenoiditis was made. Radiograph (Fig. 12): The *G* line is absent on the left side and the left sphenoid region is very dense. The left ethmoidal region is very dense. *Radiological diagnosis:* Acute empyema of the left sphenoid, and left ethmoiditis. *Operative findings:* Dr. Estopinal removed the left middle turbinate, exenterated the ethmoidal cells which were breaking down and filled with pus, and enlarged the opening of the left sphenoid sinus, from which about a teaspoonful of pus came out.

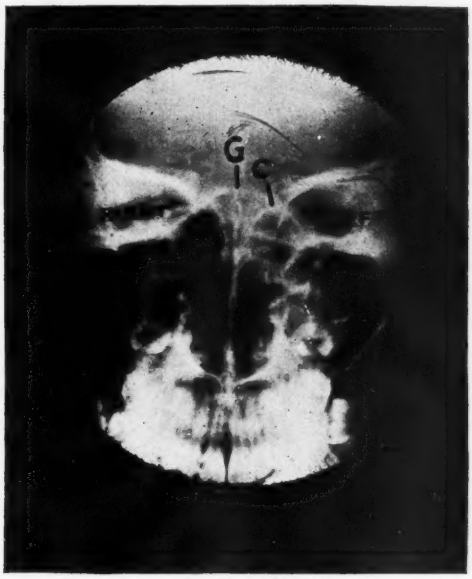


Fig. 12.

Vacuum Sphenoid on the Left Side.

Mrs. O. M. For several weeks this patient had been suffering with severe pains and stiffness in the left temporo-maxillary

articulation and in the back of the neck. The pain and rigidity were almost constant and therapeutic measures of different kinds had given her only partial and temporary relief. Radiograph (Fig. 13): The *G* line is so faint on the left side that it can hardly be seen, and the left sphenoid region is slightly dense. *Radiological diagnosis:* Vacuum sphenoid sinus on the left side. *Operative findings:* Dr. Taquino confirmed the diagnosis of a vacuum sinus condition of the left sphenoid sinus. The washings from the sinus contained a few shreds, but no pus. *After-results:* Mrs. M., who is an out-of-town patient, wrote some three weeks later that the pain and stiffness had subsided a few hours after the sinus had been washed out and that, for the first time in weeks, she had been entirely free from pain for a period of ten days.

Fig. 13.

Fig. 14.

Right Chronic Sphenoiditis with Osteoplastic Changes.

Mr. V. L., in June, 1921, had his right middle turbinate removed and his right ethmoidal cells exenterated by Dr. Ryan. Radiograph (Fig. 14), made in April, 1922. The *G* line is more distinct and thicker on the right side and the right sphenoid region is very dense. *Radiological diagnosis:* Chronic sphenoiditis with osteo-plastic changes on the right side. *Operative findings:* Pus was washed from the right sphenoid sinus. No other operation was done.

Left Hyperplastic Sphenoid and Right Vacuum Sphenoid.

Mrs. G. V. V. For over one year, this patient has been suffering with very severe pains in the top and back of the head and in the posterior muscles of the neck. At times, she had severe pains in the back of the eyes, with lachrymation. The pains for the past three months have been almost constant, and were only partially and temporarily relieved by the various treatments prescribed. Dental radiographs made about one month before radiological examination showed three abscessed teeth. These were immediately extracted, with no improvement whatever in the painful symptoms. Radiograph (Fig. 15): The left end of the

G line is dense, the right end is thin and only faintly visible; between these points the line has an irregular and hazy outline. The left sphenoid region is dense and the right one is slightly dense. *Radiological diagnosis:* Bilateral hyperplastic sphenoiditis, more marked on the left side. Probably a vacuum condition of the right sphenoid sinus. *Operative findings:* Dr. Taquino washed out both sphenoids and obtained no pus. The opening of the left sphenoid was narrowed and that of the right sphenoid was closed. Immediate relief from the pains followed the injection of cocaine in both sphenoids. This relief lasted for several hours. A few days later a submucous resection and fracture of both middle turbinates was done to insure better ventilation and drainage. The patient has been free of pains since this operation.

Fig. 15.

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2. GRANGER, AMEDEE: Positive Identification of the Sphenoid and Ethmoid Sinuses. Jour. A. M. A., Oct. 20, 1923, p. 1336.
3. GRANGER, AMEDEE: Further Observations with the Author's Sphenoid Line and His Position for Making Radiographs of the Paranasal Sinuses. Radiology, Sept., 1923.

Treatment of superficial cancer.—The radiation treatment of superficial cancer is far superior to any other therapy. Treatment by caustics should never be used, and the knife but rarely. In advanced and widespread epitheliomas, the "hyper-massive" X-ray technic gives splendid results. In some cases, radium and electrocoagulation are useful adjuncts. Failures, when found, are due almost always to inadequate doses. The "fractional" technic should not be used except in very superficial lesions. Lip cancer is best treated by radium followed by electrocoagulation, with heavy doses of filtered X-ray to the glands.

W. W. WATKINS, M.D.

The Use of X-ray and Radium in Superficial Malignancies. A. M. Cole. Jour. Ind. St. Med. Assn., March 15, 1924, p. 71.

X-RAY FINDINGS IN BONE TUMORS: EXOSTOSIS, CHONDROMAS, BONE CYSTS, OSTEITIS FIBROSA CYSTICA, GIANT CELL TUMORS[1]

By HENRY W. MEYERDING, M.D.

Section on Orthopedic Surgery, Mayo Clinic, ROCHESTER, MINNESOTA

THE proper interpretation of roentgenograms is one of the most valuable, if not the most valuable, aids in the diagnosis and prognosis of primary tumors of the long bones. The majority of bone tumors may be correctly diagnosed by experienced roentgenologists. However, a small percentage may baffle the most expert, even with the assistance of clinical and laboratory findings, and operation and microscopic interpretation may be necessary before a positive diagnosis can be reached. The roentgenologist should consider seriously the advisability of assuming the responsibility of making a positive diagnosis and prognosis from the X-ray examination alone. To recognize the site, size, origin, localization in, or invasion through osseous and periosseous structures, absorption or production of bone, the condition of cortex and periosteum, and to interpret these findings correctly, so as to differentiate the type of tumor, requires a very broad experience. The possibility of inflammatory lesions, tuberculosis and syphilis further complicates X-ray diagnosis of osseous tumors. While it is true that the vast majority of these lesions may be differentiated by roentgenograms, the value of a careful history, clinical and laboratory findings, in determining the diagnosis, should be obvious.

The surgeon's interest lies primarily in the question of whether the tumor is malignant or benign. Next in importance is the local or general character of the lesion. If local, the point of origin is of value, although secondary to the relation of the tumor to the surrounding tissue, that is, invasion or non-invasion. The relation of bone production, absorption, or replacement to normal tissue at the point of origin is of great importance. Absorption of, or invasion through the cortex and periosteum aid in differentiating malignancy and benignancy. The epiphyseal line appears, at times, to be a bar to tumor extension. The variation of the density in the architectural appearance of the tumor may or may not give an inkling as to the character of the lesion. Having localized and determined the relation of the tumor to its environment, X-ray evidence as to benignancy or malignancy is usually possible. If benign, operability may depend on the local or general character. If malignant, pulmonary metastasis or primary tumor must be considered. X-ray examination of the lung will reveal metastasis long before clinical signs are evident; thus close co-operation between surgeon and roentgenologist is essential.

Inflammatory and traumatic conditions frequently give rise to X-ray findings, such as traumatic, syphilitic and infectious osteoperiostitis, more or less resembling true bone tumors. The chronic non-suppurative osteitis described by Garré is a notable illustration, giving rise to chronic sclerosing non-suppurative thickening of the cortex, usually spindle-shaped, partially or totally obliterating the medullary cavity, and with little noticeable periosteal irregularity. Early roentgenograms of Garré's osteitis may demonstrate a localized sclerosis causing a bulging area in the cortex. The generalized ossifying hemorrhagic periostitis of scurvy is usually easily recognized. Syphilitic lesions of the osseous system may present a more difficult problem, and usually require clinical and serologic study. Syphilitic periostitis and the saber shin with the thickened convex portion of the cortex containing striated mottled areas, are fairly diagnostic by roentgenograms; yet occasionally a syphilitic lesion

[1]Read before the Radiological Society of North America, Rochester, December 3-7, 1923.

is met with, which resembles early sarcoma, or metastasis from carcinoma.

Traumatic subperiosteal or extraperiosteal hemorrhage undergoing ossification gives rise to bone, laid down longitudinally with the shaft, with a clear-cut margin as the process extends to completion. Unless seen early, when there are hazy or irregular bone deposits, this condition is usually typical and easily recognized. The history of trauma, rapid tumor formation and bone production has led to mistaken X-ray diagnosis of sarcoma, and should be borne in mind, lest radical surgery be advised.

The true benign osteogenic tumors, exostosis, chondroma and fibroma, can usually be differentiated by roentgenograms, and may be single or multiple. Exostosis may consist wholly of bone, such as osteoma, or bone and cartilage, such as osteochondroma. The bases of these exostoses arise from the cortex and may be broad, or appear as a narrow pedicle, supporting a mass of bone and cartilage resembling a cauliflower-like growth. The periosteum is reflected over the mass, and often a bursal sac is found, when there has been trauma or irritation. Cancellous bone may extend directly through the pedicle into the tumor, giving the base the appearance of bone shaft. However, the usual irregular cauliflower-like growth of the projecting mass on a bone base, and the clear differentiation of tumor are fairly characteristic; the growth does not invade the periosseous tissue, but pushes its way through it (Fig. 1).

Chondromas are usually composed of hyaline cartilage supported on a fine framework of connective tissue with remarkably little vascularity. Occasionally, irregular bony deposits, trabeculations, or calcium deposits are found. Chondromas may be single or multiple, and are difficult to distinguish from cysts, fibrocystic disease, giant-cell tumor, or malignancy. The tumor, consisting of hyaline cartilage, throws only a slight shadow; as it becomes cyst-like, it causes absorption through pressure on the surrounding bone, and bulges in the line of least resistance; the cysts may be single or multiple, with more or less clear-cut eburnated margins. The coarse trabeculations appear from shelves of bone projecting between the cartilaginous masses. Occurring as enchondromas in areas not usually associated with cartilage, or from sites of pre-existing cartilage, they may give rise to such complex X-ray findings that not only clinical but surgical intervention is required to reach a correct diagnosis (Figs. 2 and 3).

Fig. 1 (Case 1). Exostosis of the femur. The narrow base arises from the cortex of the diaphysis, supporting a cauliflower-like mass of bone with irregular surface. The base appears as smooth, normal bone continuous with the cortex, and the periosteum covers it smoothly. The cauliflower-like head is caused by irregular growth and an area of cartilage. The tumor is clearly differentiated from the periosseous structures.

Fibromas in roentgenograms appear cyst-like, and the term "fibrocystic" is often applied to them; they are rare, and difficult to differentiate from cysts and chondromas. Just where osteitis fibrosa cystica should be placed in a classification is difficult to judge. It is benign, and is apparently a low-grade infectious process or a metabolic disturbance. Occurring locally, principal-

ly in the proximal ends of the large bones, or as a generalized disease, known as von Recklinghausen's fibrous cystic disease, it presents a fairly characteristic roentgenogram. Since it usually develops early in

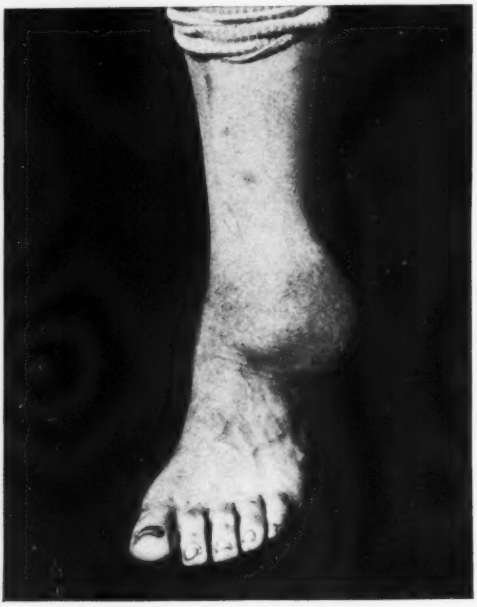


Fig. 2 (Case 2). Chondroma of the left fibula.

life, involves the diaphysis, and seldom or never the epiphysis, is of slow growth and causes little or no pain, it is seldom recognized until a roentgenogram is taken, or fracture occurs. The cystic areas, trabeculations of varying thickness and striations, appear in the cancellous, medullary and cortical bone, without periosteal involvement. Finally bulging occurs; a smooth, painless tumor becomes palpable, owing to formation of large cystic areas; later the weakened bone, subjected to strain or stress, results in a pathologic fracture which is often the first sign of cystic disease. When recognized, X-ray examination of all of the long bones is advisable to determine whether the process is local or general. Evidence of extension by invasion of the soft or osseous structures should make one suspect malignancy (Fig. 4).

Fig. 3 (Case 2). See Figure 2.

Giant-cell tumors are most common in the lower end of the radius, upper end of the tibia, and lower end of the femur. They are considered benign by most surgeons and pathologists. The difference of opinion regarding this group has been due to micro-

Fig. 4 (Case 3). Osteitis fibrosa cystica of the left tibia.

scopic interpretations when an occasional, supposedly benign tumor took on a malignant characteristic, such as metastasis, in spite of its apparently benign microscopic appearance. The roentgenographic appearance varies; however, it usually arises as a central tumor, at the end of the long bones, is slow in growth, usually expands equally in all directions with a more or less clear-cut outline, absorbs bone, but seldom perforates it, and never causes invasion. In late or long-standing giant-cell tumors, the mass may bulge out of the bone into, and separating the soft periosseous structures. The tumor itself appears either homogeneous or striated and trabeculated, owing to its irregular outline, leaving bone septums projecting into it from the periphery. Unlike osteitis fibrosa cystica, it invades and occurs in the epiphysis, destroying the epiphyseal line. An occasional long-standing giant-cell tumor may destroy the entire end of the radius, and because of its homogeneous appearance and the lack of distinction roentgenographically between tumor and healthy tissue, may closely resemble malignancy with invasion (Fig. 5).

Fig. 5 (Case 4). Giant-cell tumor of the left radius.

REPORT OF ILLUSTRATIVE CASES

Case 1 (A267447). A farmer, aged twenty-three years, came to the Clinic for consultation in April, 1919, because of a tumor on the inner side of the right femur (Fig. 1) just above the knee. A hard, firm tumor had been present about fifteen years, which was slowly increasing in size and was causing some weakness of the

OUTLINE OF ROENTGENOGRAPHIC FINDINGS IN BENIGN BONE TUMORS

TYPE	Point of origin	Local or general	Invasion	Bone production	Bone absorption	Structure of tumor	Cortex involvement	Periosteal involvement	Periosseous involvement	Epiphyseal involvement	Metastasis
OSTEOMA	Cortex	Both	No	Yes, easily	No	Bone, usually some cartilage	Continuous, with shell of tumor	Expanded over tumor	Extends into	Yes	No
CHONDROMA	Usually medullary	Usually local, rarely multiple	No	No	Yes	Locular cystic appearance	Absorption	Not involved, expands late	Extension into	Yes	Rare
BONE CYSTS	Central	Local	No	No, or solid type late	Yes	Clear-cut cystic areas, sharp outline usually	May be absorbed late or thickened: inflammatory	Usually not involved or thickened	No	May	No
OSTEITIS FIBROSA CYSTICA FIBROMATA	Medullary, cancellous, cortex	Both	No	Yes, within tumor	Yes	Striation, trabeculation, multilocular, cystic	Yes	No	No	None, rarely	No
GIANT-CELL TUMORS	Central, seldom cortical	Local	No, rarely late in X-ray	No, or late	Yes, early	Cystic, fairly sharp outline, little shadow	Absorption	Rarely perforated	No, or late	Commonly involved	No

limb. There was no history of injury. The general examination was negative. The Wassermann test was negative. A clinical and X-ray diagnosis of exostosis was made. Excision was advised and performed April 17, 1919. The

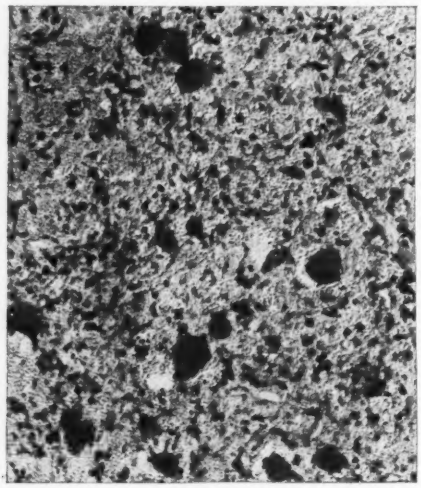


Fig. 6 (Case 4). Photomicrograph of giant-cell tumor.

patient has remained well, and there has been no recurrence. The pathologic examination showed exostosis.

Case 2 (A383863). A farmer, aged thirty-eight years, was examined in February, 1922. He had a slow-growing tumor of the outer side of the left fibula (Figs. 2 and 3). In July, 1917, he had sustained multiple injuries in a runaway accident, but he does not recall any trauma to the left ankle; there was no fracture. Two months later, tenderness was noted over the external malleolus, and soreness around the insertion of the tendo achillis. The ankle increased in size slowly for three years, until it became 3 cm. larger in circumference than the right. During the last year the swelling had increased more rapidly, the ankle had become weak and tender, and had caused him considerable discomfort.

Examination disclosed a tumor of the lower third of the left fibula, 4.5 cm. in diameter, firm as bone in some areas, and spongy and slightly tender in others. The clinical diagnosis was "low-grade malignant sarcoma." The X-ray revealed a tumor in the lower end of the left fibula, probably sarcoma. The X-ray examination of the chest was negative. The surgical consultant diagnosed a tumor of the lower fourth of the fibula, probably sarcoma, and advised exploration and excision if the tumor was benign and an amputation if malignant. February 14, 1922, a tourniquet was applied, and the tumor explored and excised; it proved to be a chondroma undergoing degeneration. The patient reported in February, 1924, that he was well and was doing farm work, but believed that there was recurrence.

Case 3 (A106074). A school girl, aged eleven years, was examined in May, 1914, because of a tumor in the middle third of the left tibia. The child had sustained two previous fractures of the middle of the left tibia; the first at the age of one year, and the second at the age of six years. Following the first fracture, a little deformity was noted, owing, it was thought, to mal-position. There was no pain or discomfort for the ensuing five years, when she refractured the tibia in the same area by stepping into a hole. Apparently the injury was not severe in either case, yet fracture occurred. Following the removal of the cast, which was worn three months, a swelling was noted. As there was no discomfort, other than itching and an occasional sharp twinge of pain in the tumor, nothing was done, and for five years she ambled about. During the last three months, the tumor had increased in size definitely.

The clinical, X-ray and surgical diagnosis was osteitis fibrosa cystica, which was verified at operation and on pathologic examination. The patient made an uneventful convalescence following curettage.

The X-ray (Fig. 4) shows the condition in May, 1914, before operation. The disease had probably existed ten years at that time. Note the multiple cystic areas in both medulla and cortex, of varying size; bony areas intervening between these fibrous cysts give rise to a medulla, trabeculated and bulging out to destroy the cortex by absorption; the periosteum is apparently unchanged. Two fractures have occurred five and ten years before, which have united and may account for the disease having existed for practically the child's lifetime. Watchful waiting failed to relieve, and the tumor was increasing without evidence of healing.

Case 4 (A173838). A girl, aged twenty years, came to the Clinic in September, 1916, with a recurring tumor of the left wrist. About eighteen months before, she had noticed pain in the left wrist. The pain gradually increased, and in September, 1915, an X-ray examination was made, and curettage performed for giant-cell sarcoma of the left radius. She then was treated by X-ray, but recurrence and pain required relief (Figs. 5 and 6).

At examination a somewhat tender tumor was palpable beneath the scar over the lower left radius. Supination and pronation were normal. Extension and flexion of the wrist were 50 per cent. The roentgenogram (Fig. 5) shows the

tumor of the distal end of the radius replacing the cancellous bone and bulging cortex until little of it remains. Coarse trabeculations, due to bone ridges at the margin of the tumor, appear. The tumor casts no shadow but appears as a homogeneous mass. X-ray examination of the chest was negative, as was the Wassermann blood reaction. At operation in January, 1916, the material curetted was reported as giant-cell tumor by the pathologist.

Therapeutic technic.—Deep X-ray technic: 11½-inch spark gap, 2 ma., .7 mm. zinc and 6 mm. wood, 16-inch distance, full dose 60 minutes. Total dose for each area in treating fibroids, 35 minutes; cancer 60 minutes. Fractional doses frequently repeated on different areas; for stimulant effect on pituitary gland, one minute three times a week; as indirect bactericide on tuberculous joints, four minutes from three directions every ten days. Tonsils, ten minutes, frequently repeated.

X-ray superficial technic: Six-inch gap, 2 ma., .2 mm. zinc, 10-inch distance, 16 minutes, exposure distributed over three weeks.

Radium needles in cancer: 10 mg. needles imbedded 1 cm. apart for 6 hours or 12½ mg. needles for 4 hours. For surface, 12½ mg. needles half-inch apart, with 1 mm. brass and 2 mm. rubber or felt for 12 hours would cause a burn. Half-inch of felt should be used and not more than six hours' time for cancer.

Skin cancers at practically any stage are curable by radium or X-ray. Section should not be removed and radiation should be confined to the lesion and small area surrounding it. Radiation should produce a decided erythema, with exfoliation. Where the mass of tissue would require an inordinate intensity of radiation to destroy, it should be first removed by electrocoagulation or electrodesiccation.

Cancer of breast should have pre-operative radiation a day or two before operation and a thorough series of X-radiation within a few weeks after operation, these latter covering both breasts, axillæ, supra-clavicular regions and pelvis, repeated every six months. If radiographs show evidence of mediastinal recurrence, highly penetrating X-rays should be used.

Any operable cancer of uterus should have radiation, with radium, before operation.

Before treating exophthalmic goiter, foci of infection should be found and eliminated, and basal metabolic rate determined. If hypothyroidism exists, stimulating doses may be applied, as follows: 11½-inch spark gap, 2 ma., .7 mm. zinc, 6 mm. wood, 16-inch distance, 6 minutes to thyroid and 6 minutes to thymus, once a week.

In prostatic hypertrophy, hard rays are used and a dense filter, applying rays to perineum through a two and one-half or three-inch diaphragm, and through numerous other portals at outlet of pelvis to secure cross-fire at prostate.

In uterine fibroids, treat through four anterior and two posterior areas, exposing only one area at each application.

Menorrhagia in a young woman should not be treated by X-ray, but judicious intra-uterine applications of radium may be used.

In leukemia, treatment is applied to bones and glands, making the spleen the last thing to be treated.

Tuberculosis is one of the fields for X-ray therapy; diseased joints are often cured.

W. W. WATKINS, M.D.

Therapeutic Uses of Electricity, X-ray, Ultraviolet Ray, and Radium: Methods and Results. Sinclair Tousey. N. Y. St. Jour. of Med., Feb. 22, 1924, p. 191.

Radiation sickness.—The authors conclude that: (1) Experimental results obtained from animals subjected to roentgen-ray treatments, without record of percentage dose, are of little value in radiation therapy; (2) so-called "radiation sickness" is not explained on the basis of injury to intestinal epithelium alone; (3) the amount of roentgen ray absorbed in the body can be used as a clinical guide in these sicknesses, unless certain glands are radiated; (4) external radiation in large doses may, and often does, stir up latent salpingitis; (5) it is absolutely essential to work with standardized roentgen-ray machines and roentgen-ray charts showing the distribution of energy. In the authors' experience with one thousand cases treated with high voltage roentgen ray, when the above factors were adhered to, the unpleasant symptoms, with the exception of headache, nausea and vomiting, were rare.

J. D. CAMP, M.D.

Consideration of Assumed Causes of Roentgen-ray Intoxication and Injuries. B. F. Schreiner and K. W. Stenstrom. Am. Jour. Roentgenol. and Rad. Ther., May, 1924, p. 451.

DILATATION AND ATONY OF THE STOMACH IN SEVERE DIABETES[1]

By ROBERT G. ALLISON, M.D., MINNEAPOLIS, MINNESOTA

ATONY of the stomach occurs either as a sequel to long-standing organic obstruction of the pylorus or cap, or occasionally occurs as a local manifestation of some severe debilitating systemic disease.

Several of the texts on medicine and surgery mention severe diabetes as a cause of gastric atony and dilatation. Kemp mentions the bulky vegetable diet as a cause. There are surprisingly few cases, however, in the current literature. The case which I will present is of especial interest in that the condition developed and subsided while the patient was undergoing treatment in a hospital.

Miss H., age twenty, entered the University Hospital on June 26, 1923. *Complaint:* Loss of weight and strength, and increasing thirst. *Patient's History* is negative, except for the fact that she has known for the past five years that she has diabetes mellitus. *Physical Examination* is negative, except for extreme emaciation. Height, 5 feet 2 inches. Weight, 70 pounds. Her maximum weight was 135 pounds five years ago. Two years ago she weighed 110 pounds. There had been an extremely rapid loss of weight within the past few months.

The patient was placed on an optimal diet of Wilder. Under this diet and ten to fifteen units of insulin per day, her progress was satisfactory. The patient complained of extreme hunger, and for this reason was allowed, in addition to her regular diet, thrice-cooked 5 per cent vegetables in large amounts. It later developed that she was taking more bran muffins than the ordinary diabetic patient.

After two weeks of this régime, the patient complained of abdominal distention. Physical examination at this time was negative, except for an extreme degree of atony of the abdominal muscles.

A few days later, the patient, after a heavy breakfast of bulky food, developed severe nausea and some vomiting. The vomitus contained material eaten several days previous.

Fig. 1. Plate made before the ingestion of a barium meal showing the mixture of food and air in dilated stomach.

Physical examination at this time disclosed a large, soft mass in the epigastrium. This extended nearly to the pelvic brim. This mass moved with respiration, and a succussion splash was elicited. There was no tenderness, pain or rigidity. High enemata gave no relief. The possibility of tuberculous peritonitis was considered clinically at this time, and X-ray examination was requested. The following report was submitted following examination:

A single plate was made including the entire abdomen and pelvis. The shadow of neither kidney is seen, nor is the shadow of either psoas muscle visualized. The

[1] Read before the Radiological Society of North America, Rochester, Minnesota, December, 1923.

liver shows distinctly, and is not enlarged. The entire abdomen presents a hazy, speckled appearance, which in our opinion could be caused only by finely subdivided food particles and gas. Owing to the homogeneous nature of this shadow and the absence of intestinal markings, we would believe that it represents retained food in a markedly dilated stomach. A barium meal was then administered under fluoroscopic control. The stomach is hugely dilated and atonied. The greater curvature rests far below the pelvic brim. There is no visible peristalsis. It is impossible to visualize the pyloric end of the stomach and the greater portion of the lesser curvature. This is due to retained food which makes it impossible to fill these portions.

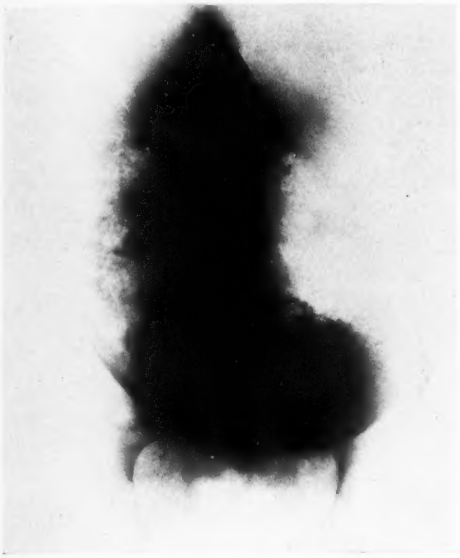


Fig. 2. Plate made immediately following barium meal showing dilated and atonic stomach with filling defects caused by retained food.

Fluoroscopic examination at six hours shows a complete gastric retention.

Fluoroscopic examination at twenty-four hours after the ingestion of the barium meal shows a small amount of the solution in the lower ileum, with a 90 per cent gastric retention.

The roentgen conclusions on the above examination were as follows:

Markedly dilated and atonied stomach. Owing to the large amount of retained food, we are unable to state definitely whether there is an organic lesion of the pylorus or cap. We believe, however, that such a lesion must exist.

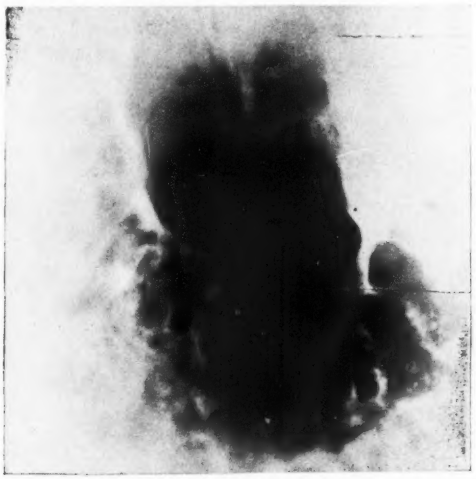


Fig. 3. Plate made immediately after barium meal, just before discharge from hospital. This shows normal sized stomach which is emptying at a normal rate.

Immediately following the X-ray examination, the patient was put on a 5 per cent glucose solution by rectum. No fluids or food by mouth were allowed. The patient was instructed to lie continually on her right side. The stomach was aspirated three or four times daily. Varying amounts were returned through the stomach tube. The tube each time became plugged with débris. The aspirated material consisted of barium, vegetable fibres and bran. Sufficient insulin to take care of the glucose intake by rectum was continued through this period. After a week of this treatment, the abdominal mass had entirely disappeared on physical examination.

A second X-ray examination of the gastro-intestinal tract was requested at this time, and the following report submitted:

Fluoroscopic examination six hours after the ingestion of a barium meal shows

the head of the barium column in the transverse colon, the tail of the column in the lower ileum.

Fluoroscopic examination and a series of plates made immediately after the ingestion of a second barium meal show the stomach to be normal in size, shape and position. Peristalsis is vigorous and everywhere observed. There is no deformity of the walls of the stomach, and the cap is clean-cut and undeformed. The stomach is emptying at a normal rate.

Fluoroscopic examination twenty-four hours after the ingestion of the second barium meal and thirty hours after the ingestion of the first meal shows the head of the column in the rectum, the tail of the column in the cecum. The cecum is freely movable. The appendix is not visualized, and there is no tenderness on palpation.

CONCLUSIONS

We are unable to detect any evidence of abnormality of the gastro-intestinal tract. The stomach has regained its normal tone and peristalsis. It has also returned to normal size, and is functioning in an apparently normal manner.

Following this, the patient was placed on limited fluids, and a diet containing as little bulk as possible. Insulin was continued. During this period, she showed no additional symptoms and no complications.

Another X-ray examination was made before her discharge, on August 15th. This gave identical findings with the last examination. The patient had improved markedly. Her weakness had decreased, the muscular tone was better and the flaccidity of the abdominal muscles was rapidly disappearing.

During her stay in the hospital, her blood sugar varied from .40 to .28 per cent per c.c. of blood. At no time did the carbon dioxide combining power of the blood fall below 37 volume per cent.

The patient has been followed through the "Out-patient Department" since her discharge. Her weight is steadily increasing, and she has shown no complications, gastric or otherwise.

Tumors graded as to radio-sensitivity.—Tumors vary in radio-sensitiveness within fairly wide limits. The relative sensitiveness of neoplasms to radiation may be roughly graded according to type, as teratoma, lymphoma, sarcoma, carcinoma or epithelioma (basal cell, squamous cell), endothelioma, and melanoma.

Radiotherapy is not a cure-all in malignant conditions. It cannot be called a curative agent, since in but a small percentage of cases is the disease permanently overcome. This small percentage could be greatly increased if patients were referred to the radiologist earlier.

W. W. WATKINS, M.D.

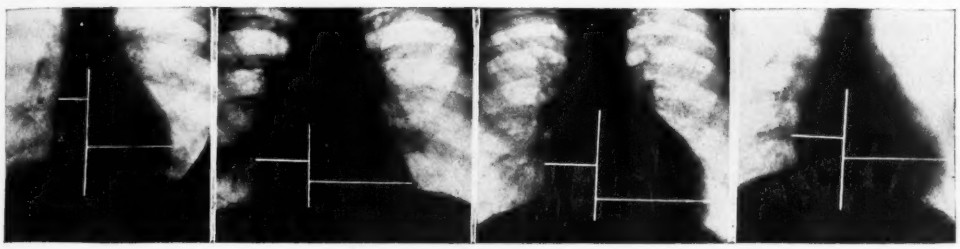
The Present Status of Radiation Therapy in Cancer. Arthur U. Desjardins. Journal-Lancet, Feb. 15, 1924, p. 103.

A RATIONAL METHOD FOR DEMONSTRATING THE HEART [1]

By PAUL EISEN, M.D., DETROIT

IT MAY seem preposterous to advocate a rational method for demonstrating the heart, since the image of this organ is one of the oldest and best-known roentgenograms. Still, when we consider the method usually employed we find two fundamental errors.

In the lateral view, as you all know, the base of the heart is seen in the middle chest with the tip just touching the chest wall, the heart axis being at an angle to and not parallel to the anterior chest wall where the heart shadow is hidden in the shadow of the diaphragm. However, if we lower the focal point to the tenth rib to overcome some of the distortion, still more of the heart shadow is hidden below the shadow of the diaphragm. But if we at the same time have the patient take an extremely deep breath, holding it a second with open mouth, and then make the exposure, we not only get a correct heart shadow but have it entirely separated from the shadow of the diaphragm. The central ray is above the

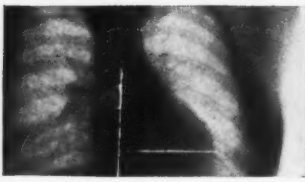


No. 1. T.T.D., 13.2 cm. (normal) No. 2. T.T.D., 15.7 cm. No. 3. T.T.D., 17.8 cm. No. 4. T.T.D., 16.2 cm. (lues)

film rests. In stout patients it is most difficult to approximate the upper chest snugly to the film. The same principle exists in radiating the upper teeth, where the apex is farther away from the film than the crown. But the oral roentgenologist has early overcome this distorted elongation of the root by projecting the tooth apex into the middle of the film and raising the focus, whereas many roentgenologists still adhere to the method which casts a distorted image of the heart. With this technic the central ray passes obliquely downward from the sixth dorsal rib in order to separate the heart from the dome of the diaphragm. This is possible in the average patient, but in all large and especially stout patients, weighing two hundred pounds and more, very little of the heart is seen on the roentgenogram because, with the degree of inspiration at which the exposure is taken, most of the dome and the lower divergent ray runs parallel with the front slope of the diaphragm, so that a sharp demarcation is obtained between the lower heart boundary and the shadow of the diaphragm. The lowered focus also gives a rounded, sharp outline to the tip of the heart and not the distorted one seen with the method which we formerly used.

Before making the exposure the heart is studied fluoroscopically and the correct point for the central horizontal ray is noted, as is also the degree of inspiration which the patient is able to accomplish. It is anything but easy to induce a large, stout patient to take a sufficiently deep breath and to hold it long enough to insure an exposure. At first one sees only the upper part of the heart and is then surprised to see an enormous heart emerge out of the diaphragm shadow on deepest inspiration.

[1]From the Department of Roentgenology of the Jefferson Clinic and Diagnostic Hospital, Detroit. Paper read before the Radiological Society of North America at Rochester, Minnesota, December, 1923.



No. 5. T.T.D., 13.2 cm. (normal)

No. 6. T.T.D., 21.2 cm. (weight, 234 pounds)

No. 7. T.T D., 15.6 cm. (weight, 175 pounds)

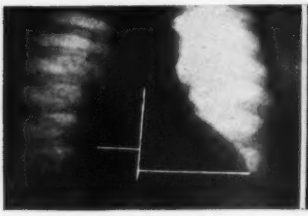
The objection formerly raised against forced inspiration was, strange to say, the assertion that deepest inspiration narrows the heart image. But the heart is a solid organ when filled with blood and is not compressible by its change in location, but only by contraction of its walls, which is very slight. Therefore, the heart cannot become any smaller, even by the deepest inspiration, and the lower incident angle gives a more correct image of it. Distortion also depends upon the distance from the tube focus to the film and upon the size of the focus itself. Lowering the focal point below the eleventh dorsal rib brings the middle diaphragm again higher, and this higher diaphragm again obliterates the divisional space between it and the lower heart border. In thin patients the older method is fairly accurate, but the larger and stouter a patient the more inaccurate this method becomes.

The method of lowering the focus accompanied by deepest inspiration has the further advantage of producing greater contrast between the heart and the better aerated lung tissue. But the method described does not allow twice the heart diameter to tally with the chest diameter, as by the former method, for numerous measurements have taught me that deepest inspiration increases the chest diameter to quite a little more than twice the transverse heart diameter.

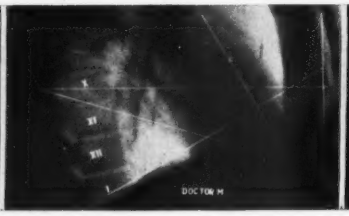
A further and important advantage is gained with this method by better demonstrating the triangular shadow at the heart tip through which the true heart shadow may be seen, and also the hepatic veins at the right corner.

A well-marked bifurcation of the trachea should be the criterion to judge if the exposure and development are correct. A complete, sharp delineation of the heart border and of the diaphragm is secured if the time of exposure be sufficiently short and respiration at a standstill, an exceedingly difficult thing to attain in obese patients. Fast films and screens, possibly with Potter-Bucky diaphragm, are essential, although I have not yet used the latter in this work. Speed is of the utmost importance and the larger the patient the more speed required.

In exceedingly large patients the clinician is absolutely unable to obtain accurate information as to the size of the heart, to say nothing about the even more important factor of its shape, because percussion is nearly impossible, and palpation of the heart apex



No. 8. T.T.D., 15.6 cm. (weight, 211 pounds)



No. 9. Lateral (weight, 206 pounds)

No. 10. T.T.D., 18.5 cm. (cardio-renal)

unreliable. In fat women with pendulous breasts and in big men, the finger sinks right into the soft parts covering the chest wall.

Another domain of importance is that of goiter patients with a toxic, rapid, irregular heart. The clinical examination is misleading because these often typically long hearts in goiter reach far down and are difficult to separate from the diaphragm, just like hearts in patients with emphysema pulmonum. Percussion reaches only the upper heart border.

Take, for instance, a large, stout woman with cardio-renal decompensation, edema and large, pendulous breasts. The clinician is absolutely unable to arrive at a correct estimate of the size and shape of this patient's heart without a good roentgenogram correctly taken.

Another important and neglected field in all patients is the early recognition of a heart lesion, the detection of which is fluoroscopically impossible, only the most accurate measurements disclosing a slight enlargement or deformity. It is much more important to the patient to have an early heart lesion detected than an incipient lung affection. The heart lesion is of far greater importance, as vital statistics of the government show.

Then, again, to exhibit a heart of normal size and shape in stout patients who are suspected of decompensation is of the utmost importance. Every patient at our clinic going through a complete examination has a heart study made as a routine, and it is surprising how often pathology can be detected in this way, if the necessary care and accuracy are employed.

The slides to be shown were all taken at a thirty-three inch distance, due to working conditions, but as a general rule, be it said, that the larger the patient the greater should be the distance between the tube focus and film.

The upper chest is properly approximated to the cassette, the shoulders are both touching it, with the elbows either thrown forward or around the cassette, in the case of very stout women with large breasts.

In conclusion, let me state that the method has been used by me for fourteen years.

My thanks are due Dr. George P. McNaughton, head of the Department of Medicine of the Jefferson Clinic, for his many valuable suggestions.

The Coolidge tube.—A series of experiments made in an attempt to ascertain if energy variations from different "universal" Coolidge tubes could be detected by skin effects. The authors' ionization results differ from those obtained by Coolidge and Kearsley. The latter determined a maximum intensity variation of 87.5 per cent with unfiltered radiation and only 12.9 per cent with a filter of 3 mm. Al. MacKee and Andrews obtained a maximum difference of 57.8 per cent with unfiltered radiation and 75.7 per cent with 3 mm. Al. Variations in clinical reaction agreed, to a certain extent, with the energy output as estimated by ionization; that is, the tube recording the highest efficiency effected the most pronounced reaction and *vice versa*. The authors discuss several possible explanations for the difference between their findings and those recorded by Coolidge and Kearsley.

Because of the variation in tube output and because, as determined by Coolidge and Kearsley, this is lessened by the use of a filter, many dermatologists and roentgenologists are advocating filtration, as a routine for the treatment of skin diseases. The authors believe that unfiltered radiation is desirable for many dermatological conditions; that variations in degree of skin reaction with different Coolidge tubes, operating under like conditions, are almost imperceptible with both filtered and unfiltered radiation; that iontoquantimeter experiments show a marked difference in output even with filtered radiation; that it is not necessary for the purpose of safety to use a filter to equalize the output from various Coolidge tubes; that the unfiltered roentgen technic employed in this country for superficial work is satisfactory, efficacious and safe.

J. D. CAMP, M.D.

Coolidge Tube Quantitative Variations. G. M. MacKee and G. C. Andrews. Amer. Jour. Roentgenol. and Rad. Ther., July, 1924, p. 525.

A NEW BUCKY STAND

By LOUIS K. POYNTZ, M.D., PORTLAND, OREGON

SINCE Potter developed the moving grid and made practical the Bucky Diaphragm this instrument has become a necessary part of every serious X-ray installation. The brilliancy of the results obtained by its use has forced even the unwilling to adopt it. However, because of the fact that the instrument is heavy and awkward it requires a specially constructed table for its use, or it must be lifted onto the table each time it is required.

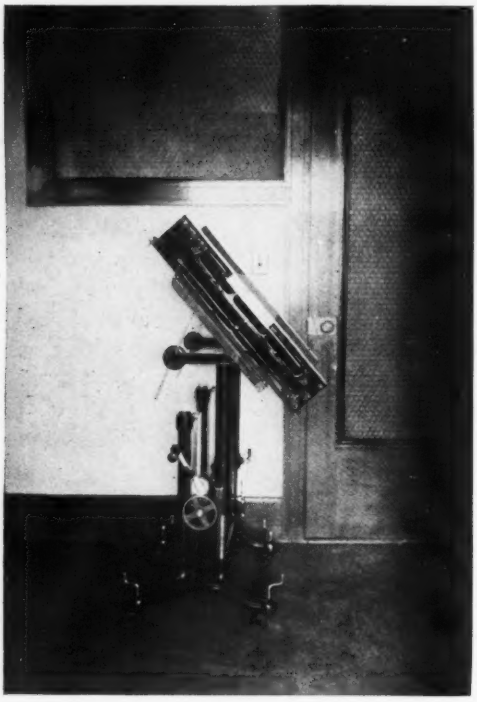


Fig. 1. End view of "Bucky Stand." The diaphragm is in the 45-degree angle and elevated halfway.

This latter difficulty accounts for the fact that very often use is not made of it, because its use requires no little effort, especially for one's nurses to lift it. Quite aside from the inconvenience of this constant moving is the fact that the instrument suffers ten times more abuse by this unnecessary handling than results from actual use.

Fig. 2. Front view of "Bucky Stand," with the diaphragm in the horizontal position, elevated midway between extreme high and low positions.

The matter of a specially constructed table obviates most of these difficulties, but still leaves much to be desired, particularly the convenience of the vertical and intermediate angles. It was a desire to secure a really convenient and "flexible" Bucky that caused me to devise and have constructed an appliance that eliminates at least some of the disadvantages found by the other method and does aid materially in the routine work.

The illustrations show the salient features of the apparatus.

The supporting stand is an old Kelley-Koett type G Table, which I had cut down to the proper size to support the Bucky Diaphragm, which is bolted to it.

By a crank it is possible to raise or lower the apparatus to the desired level. It has considerable vertical range. In the "low" position the center of the diaphragm is 32 inches from the floor, and the lower edge

Fig. 3. Showing the practical use of the stand for gastro-intestinal and other trunk plates, with the patient erect.

22 inches from the floor. In the "high" position it is elevated 17 inches, as the center is now 49 inches from the floor. The top being 10 inches higher means that the extreme range of the apparatus is 22 inches to 59 inches from the floor, which is absolutely ample for a child or an adult, and so allows for the inclusion of the pelvis or shoulder of any average individual in the standing position, while by seating the patient the head may also be easily covered. Figures 1 and 2 show the details of the "stand" and are so obvious as to require no further elucidation. The ordinary compression band fixes the patient securely in the desired position and so stereoscopic plates are possible, as illustrated in Figures 3 and 4, without fear of movement.

There is no necessity to dwell at length on the distinct convenience of such a contrivance. Gastro-intestinal and kidney

Fig. 4. Showing the convenience of the stand for head and sinus examinations.

plates may be made in the erect position with greater ease than before. The patient does not have to assume an uncomfortable position for lateral spine, esophagus, or similar examinations. Head and sinus examination may be made with the patient comfortably seated in an arm chair, as contrasted with the awkward position on the horizontal type of Bucky, where it is extremely difficult to secure a comfortable adjustment, especially in the lateral position, because of rotation of the shoulders. Contrast the usual posture with Figure 5.

By having two small tables of the same height as the Bucky in the low horizontal position, a table is easily assembled for the prone positions. The Bucky may be in

the middle, or at the end of the three segments, allowing for the desired part to be placed on the diaphragm. These small tables need not have a curved top and, in fact, they are preferably flat—then they are available for all horizontal positions. If they are constructed like the ordinary hospital bedside table with a small cupboard, this is then available as a convenient place for sand-bags or other accessories ordinarily in use. This makes a table for routine radiography and no other is required, whether the Bucky is used or not, and so avoids the necessity of a Bucky table and a flat table for routine radiography.

There are several other features or refinements of the apparatus that I have devised, but their description will be set forth in a later issue.

The apparatus, being on casters, can be wheeled out of the way with a minimum of effort, or is available for use in several different rooms.

A really practical use of the Bucky stand is in gastro-intestinal work. One can with regular certainty and a precision that is pleasing place the duodenal cap on a small film, even 5x7, if desired. The details of this procedure will constitute another article.

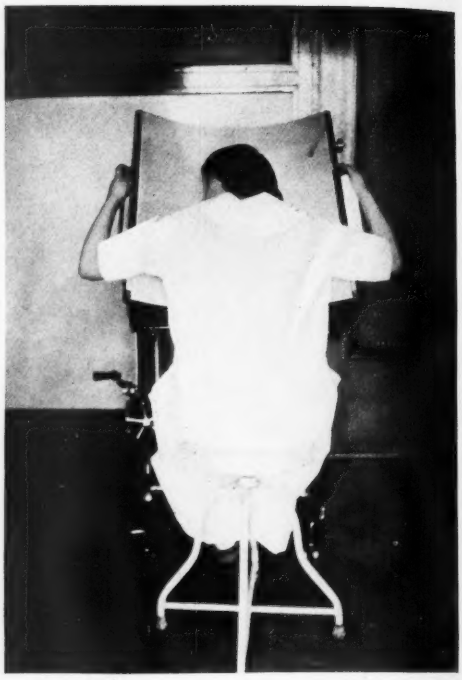


Fig. 5. Showing the lateral head position. Note that the shoulders do not interfere and that the head may be located on the center of the diaphragm.

ADVANTAGES OF THE POYNTZ-BUCKY STAND

1. It allows for the making of Bucky plates in the vertical, horizontal, or any intermediary position.

2. Because of the elevating feature it may be readily adjusted to a given area or patient.

3. It allows for the demonstration of fluid levels, as, for instance, in chests.

4. It is mechanically simple, its construction is rugged and not costly; therefore it is practical. Anyone can adjust it and can duplicate positions or angles.

5. Being on casters, it is readily wheeled out of the way when not in use, or taken into another room, if desired.

6. It saves the back-breaking lifting and the Bucky-breaking dropping.

7. By the use of two small end tables no other table is necessary or required for any ordinary position.

8. It allows for everything the ordinary Bucky does and much more. In a word, it is convenient.

HEMANGIOMA, WITH CALCIFICATION: PRE- AND POST-OPERATIVE X-RAY FINDINGS[1]

By H. J. RAVOLD, M.D., St. Joseph, Missouri

CALCIFICATION of hemangiomata is a rather rare phenomenon, or else it is rarely mentioned in medical literature in America. This is apparently true of Europe, also, for C. P. G. Wakely (1), F.R.C.S., of King's College Hospital, writing in 1921, states that he was able to find only one reference to this condition, and that one was in American literature (2).

Fig. 1. Pre-operative appearance of the forearm.

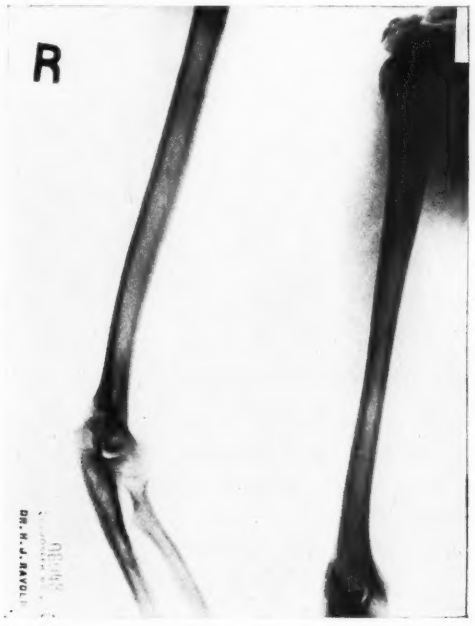


Fig. 2. Showing that there were no calcified bodies above the elbow.

Hemangiomata are composed of newly formed vessels (3), and are benign in character. The condition is usually congenital and may be situated near the skin, or in deep tissues. The cavernous type is progressive, and enlarges by distention of the original vessels, and by formation of new vessels.

The condition is not usually characterized by calcification. When this does occur the X-ray appearance is that of round or oblong bodies with concentric rings within them (4). These calcifications are distributed irregularly, and occur usually in the extremities, most often in the forearm and hand.

The statement has been made that calcification occurs only in tissue that is dead or inert, and this seems to be borne out by a microscopical examination in one of Wakely's cases, which indicated that the probable sequence of events was "thrombosis, fibrosis and then calcification" (1).

My experience is limited to one case, a girl of 15 years. An interesting feature of the case is that no surface indications were apparent for a period of *eight years*. The pain in the forearm was first noticed when she was 5 years of age. This was quite

[1]Read before the Radiological Society of North America, at Rochester, Minnesota, December, 1923.

severe and lasted two days. The next attack appeared in two months. After that, the intervals became shorter and the attacks more painful, lasting sometimes as long as a week.

Fig. 3. Post-operative appearance of the forearm.

About two years ago a small swelling was noticed over the middle of the radius on both the posterior and anterior surfaces of the forearm. The swelling disappeared under pressure, but there were no palpable nodules. There was no redness, nor other discoloration, but some pain on deep pressure. During the month preceding our examination the pain had been almost continuous. Our report to the referring surgeon designated the condition as probable hemangioma with calcified nodules.

The surgical operation revealed a "network of enlarged veins which were wrapped around the radius underneath the flexor and extensor tendons. Hard foreign bodies imbedded in the veins were pushed against the bone by the tendons. These nodules were removed, and the veins ligated and removed." The patient experienced complete relief from the operation.

Of the eleven calcified bodies removed,

Fig. 4. The eleven calcified bodies removed, the largest measuring .6 cm. in diameter.

the largest measured about 0.6 cm. in diameter.

An analogous condition is frequently found in the pelvis, and is known as phlebolithiasis. These calcifications do not cause pain. They may be mistaken for ureteral stones.

The outstanding features of this case appear to be: (1) A period of eight years with no surface indications; (2) Complete relief of pain by removal of the calcified nodules; (3) The diagnosis could be made by means of the X-ray only.

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DIAPHRAGMATIC HERNIA, NON-TRAUMATIC [1]

By MORRIS I. BIERMAN, B.S., M.D., WASHINGTON, D. C.

THE definition of diaphragmatic hernia requires the protrusion of abdominal viscera through a congenital or acquired opening in the diaphragm into the thorax. A true hernia requires the presence of a sac composed of a layer of peritoneum within and a layer of pleura without. A false hernia has no hernial sac, the abdominal viscera lying free within the thoracic cavity. These visceral protrusions occur either when there is deficient development with congenital weakness of the muscular layer of the diaphragm, and a weak spot exists through which the abdominal contents can force themselves, or when any one of the existing foramina is congenitally wide or at some time later in life becomes so.

Diaphragmatic hernia has been recognized for many years. Stehelinus, in 1724, reported a case in which postmortem examination showed that the stomach had passed through the diaphragm into the thorax. However, a cross-reference to the writings of Clauder, in 1661, seemed to indicate that he had preceded Stehelinus in the recognition of this condition by many years, but the present writer was unable to obtain his actual work. Since that time, case reports have been made in ever-increasing numbers, and now they appear to total several thousands. Until the advent of the X-ray, diagnosis was made only on postmortem examination, and up until 1905, in only about ten instances had the diagnosis been made during life. With the improvement of the roentgen-ray apparatus and technic since that time, the diagnosis has changed from an extremely difficult task to a relatively simple procedure.

The classification of hernias of the diaphragm may be attempted with regard to the etiology and type of lesion. The following tabulation will serve to set forth at a glance the various gross characteristics of this group of diaphragmatic abnormalities:

1. *Congenital diaphragmatic hernia*
   - *a.* True congenital hernia.
   - *b.* False congenital hernia (85 per cent).
2. *Acquired diaphragmatic hernia*
   - *a.* True acquired hernia.
   - *b.* False acquired hernia.
3. *Traumatic diaphragmatic hernia*
   - *a.* True trumatic hernia (very rare).
   - *b.* False traumatic hernia.
4. *Eventration of the diaphragm (not a true hernia).*

The clinical manifestations of true and false hernias are similar, but their anatomical differences necessitate their differentiation. In order to gain a clearer insight into the origin of these conditions, it is well to review what is known of the development of the human diaphragm.

Just caudad to the visceral arches the embryonic celom dilates at a very early stage and forms the primitive pericardial cavity. The two anlagen of the heart unite to form the primitive heart, and this is suspended in the primitive pericardial cavity by dorsal and ventral mesenteries. The mesenteries quickly disappear and the heart remains attached only to the large vascular trunks. As the primitive pericardial cavity is simply the dilated cephalic end of the embryonic celom, it is, therefore, directly continuous with the rest of the body cavity.

The pushing outward of the splanchnic mesoderm on each side forms a partition which is attached, on the one hand, to the mesentery and, on the other hand, to the ventral and lateral body walls. This partition, the *septum transversum,* closes the ventral portion of the communication between the pericardial cavity and the rest of the embryonic celom. Dorsally the com-

[1] Read before the Medical Society of the District of Columbia, Washington, D. C., March 19, 1924.

munication remains open on each side of the mesentery. This communication is called the pleuro-pericardial duct. These ducts are the cavities into which the lungs grow, the pleural cavities.

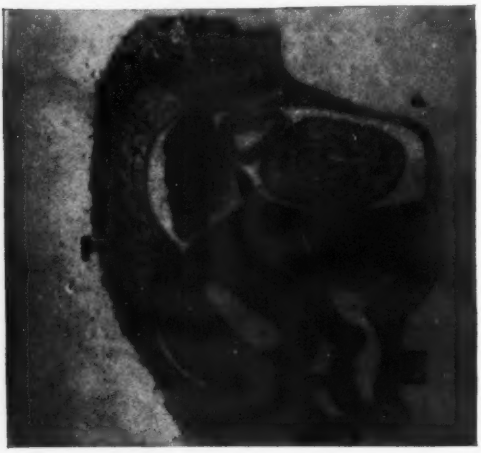

Fig. 1. Showing last portion of diaphragm to close (p). This is the most frequent site of hernia.

Finally, folds grow from the lateral and dorsal body walls and unite ventrally with the primary diaphragm and medially with the mesentery. These folds, the pleuro-peritoneal membranes, separate the pleural cavities from the peritoneal cavity, and complete the diaphragm. It is thus seen that the diaphragm develops from the septum transversum ventrally, and the pleuro-peritoneal membranes dorsally.

Deficient or incomplete union may take place between the two portions of the diaphragm, and here occurs one of the most important sources of hernia. The continued patency of the pleuro-peritoneal duct belongs to the same class of developmental abnormalities as hare-lip and cleft palate.

Hernial protrusions of abdominal viscera have been observed through practically every portion of the diaphragm as well as through the esophageal foramen, through the opening for the sympathetic trunk, through the sterno-costal space, and through the triangular space bounded by the outer lumbar crus, the adjoining costal portion and the last rib. No observations have been made of hernia through the openings for the aorta and inferior vena cava.

Since non-traumatic diaphragmatic hernia is due to congenital maldevelopment, we would expect to find a large percentage of cases occurring in infants. This has been borne out by the number of postmortem reports of diaphragmatic hernias found in infants, both in still-born and those living from a few hours to several days or weeks. The degrees of hernia varied from protrusion of only part of the stomach into the thorax, to complete collapse of the lung, with all the abdominal viscera in the chest. Occasionally children live a few years, to seven, eight or ten. Those patients who die at a fairly early age usually are chronically ill, and give a history which does not appear to correspond to any particular disease, although the cardiac and gastric symptoms are probably more in evidence. Obscure chronic or intermittent ailments of children should always arouse suspicion of congenital diaphragmatic hernia. Probably most cases of congenital hernia die during infancy or childhood, but we know that a great many live a normal span of years. Bailey has reported a case of a patient who died at the age of 77 of arteriosclerosis and interstitial nephritis. He had no gastric symptoms whatever at any time. On routine postmortem examination diaphragmatic hernia was found, and it was seen to be enclosed by a peritoneal sac. It was undoubtedly a congenital hernia. However, not all those suffering from this condition are so fortunate as to live to such an age as Bailey's patient.

The clinical history of this condition may be very misleading. Often there is no history whatever. It seems strange that such enormous distortion of the viscera can occur without subjective symptoms, but the number of routine postmortem examinations which bring to light this unusual type of hernia in patients who showed no symptoms or signs of hernia during life, goes to prove their greater incidence than is gen-

erally supposed. On the other hand, there are cases where the patient is prostrated at frequent periods with few or no symptoms in the interval. However, the majority of diaphragmatic hernias give some evidence of their presence.

Where clinical evidence does occur, there is frequently distention of the affected side, with fullness of the inter-spaces; displacement of the heart to the unaffected side, usually the right; diminished thoracic motion; absence of Litten's sign; sometimes tympanitic resonance and sometimes dullness; normal pulmonary resonance with vesicular breath sounds over the upper half of the chest. In place of the respiratory murmur there may be splashing and metallic sounds, with a great variation of these, according to the degree of fullness of the stomach. As would be expected from the physiology of the organs involved, when the stomach or intestines contain food or liquids the adventitious sounds are marked, but when the stomach and intestines are empty there is frequently entire absence of any signs whatever. This periodical variation with relation to meals is highly important evidence toward the final physical diagnosis.

The most important symptoms experienced by the patient are dyspnea on exertion or on lying down, particularly when lying on the right side; intermittent rapid pulse and feeling of suffocation; generalized pains and increase of dyspnea after meals; rumbling in the chest; feeling of fullness and oppression in the chest after meals; occasional vomiting, sometimes bloody; constipation, dysphagia, and malnutrition.

The following are the histories of three cases of diaphragmatic hernia:

Case 1, male, white, age 30, cattleman. *Family history*, negative. *Past history*, whooping cough at nine years of age.

Present illness: Feels fairly well, with the exception of being troubled a good deal with fullness and distress after meals. The trouble has become aggravated of late. There is now pain in the epigastrium, left lower chest and left shoulder. There has been but little change in the character of the pain for the past year. The pain usually starts first in the left shoulder and in the epigastrium. Distress comes usually almost immediately after eating. Liquids often cause much more trouble than solids. The patient states that when the stomach is "bad" he has pain in the lower left chest. When there is much trouble, or when he vomits, his heart pounds a great deal. There is definite relief on vomiting, and he has vomited food eaten thirty-six hours previously. His appetite has been very good. Bowels usually regular. Sleeps rather poorly. Feels best when lying on his left side with the knees moderately drawn up.

Fig. 2 (Case 1). Showing upper pole of stomach protruding through diaphragm into thorax.

Physical examination: Lungs negative with the exception of a tympanitic note over the left base, heard more distinctly at one time than at another. There was also some gurgling in the left lower chest. Heart negative except that pulse is easily accelerated on exertion. Wassermann and urine, negative. Test meal: free HCl, 30; total

acidity, 42; trace of occult blood. Blood pressure: systolic, 108; diastolic, 84.

Case 2, male, white, age 27, electrician. *Family history:* Brother is now in a tuberculosis sanitarium undergoing treatment. Parents and one sister apparently well.

Fig. 3 (Case 3). Showing stomach and large bowel filled with barium, having protruded into thorax.

Past history: Measles and mumps during childhood. Malaria at age of 12. Neisserian infection at 17. Influenza in 1918, ill only four days. In October, 1920, noticed that his sputum was blood-streaked after some particularly great exertion. Paid no attention to this until about a month later when he coughed up considerable greenish material. Then decided to consult a physician.

Physical examination: Over the right apex there was impaired resonance with sharp subcrepitant râles, which persisted after coughing. Over the upper portion of the left lung there was dullness and increased vocal fremitus. Subcrepitant râles were more numerous than on the right side and persisted after coughing. Blood pressure: systolic, 116; diastolic, 84.

On radiographing the patient definite tuberculous lesions were found in the left upper lobe and right apex. My attention, however, was attracted to the unusual configuration of the diaphragm. Further investigation showed the condition to be diaphragmatic hernia. There were no symptoms at all referable to the gastro-intestinal tract or the cardio-vascular system.

Case 3, male, white, age 33, mechanic. *Family history*, negative. *Past history*, negative.

Present illness: States that his present condition started in March, 1919. He has pain over both sides of the chest, loss of appetite, insomnia, hemoptysis, weakness, shortness of breath and loss of weight. Has a feeling of oppression when lying on the right side, and at times his pulse beats very rapidly. Has noticed this to occur most often after meals. Has felt what he considered to be water splashing in his left thorax. On account of being so easily fatigued he is unable to work.

Physical examination: Right side and upper third of the left chest appear normal with the exception that the right cardiac border appears to extend close to the right mammary line. The lower half of the left chest gives tympanitic resonance on percussion. On auscultation there are detected harsh breathing, gurgling and metallic sounds.

The most important conditions from which diaphragmatic hernia must be differentiated, and which are the most confusing clinically, are:

1. Hydrothorax.
2. Pneumothorax.
3. Hydropneumothorax.
4. Lung abscess.
5. Tumors.
6. Eventration of the diaphragm.

A radiogram of the normal chest shows the heart to be fairly centrally placed. There are distinct bronchial trunks running outward from the hili toward the bases. The diaphragmatic contours are smooth and sharply defined. The right diaphragmatic curve is one-half to one inch higher than the left. Their respiratory excursions

are practically equal, descending with inspiration and rising with expiration.

Hydrothorax. In hydrothorax there is a dense shadow obscuring the diaphragmatic outline, beginning usually in the costophrenic angle. The upper border of the fluid, whether pus or serum, is concave, the degree of concavity depending upon the height of the fluid. The heart is displaced toward the opposite side.

Pneumothorax. In pneumothorax there is complete absence of the lung markings which are always present in the normal chest, and the collapsed lung can be seen in the region of the hilus. Where there are adhesions the collapse is not complete.

Hydropneumothorax. In this lesion the conditions are the same as in pneumothorax, with the exception that there is fluid in the thoracic cavity. On the individual assuming the upright position, the fluid shows a characteristic horizontal line. The contour of the diaphragm, however, is obscured.

Lung abscess. In lung abscess there is a heavy shadow fairly well circumscribed, which usually has some broken-down necrotic tissue at its center. This area of lung destruction is shown as a lighter area on the film, and in the upright position there may be seen at times a horizontal fluid line.

Tumors. When radiographed early, tumors cast a heavy, dense shadow which is fairly well circumscribed. Later there is frequently a pleural effusion which obscures the primary malignancy and the picture then is characteristic mainly of fluid.

Eventration of the diaphragm. In eventration one-half of the diaphragm becomes greatly relaxed, so that the abdominal organs encroach upon the thoracic cavity and a hernia is simulated. The diaphragm remains intact, however, and there is no sac or hernial ring. This is probably the most important condition from which hernia of the diaphragm must be differentiated, as in hernia clinical manifestations may warrant surgical interference, while eventration is distinctly a non-surgical condition.

Frequently, in both hernia and eventration a narrow, dense line arches across the left side of the chest at the base. This is the shadow cast by the diaphragm. In

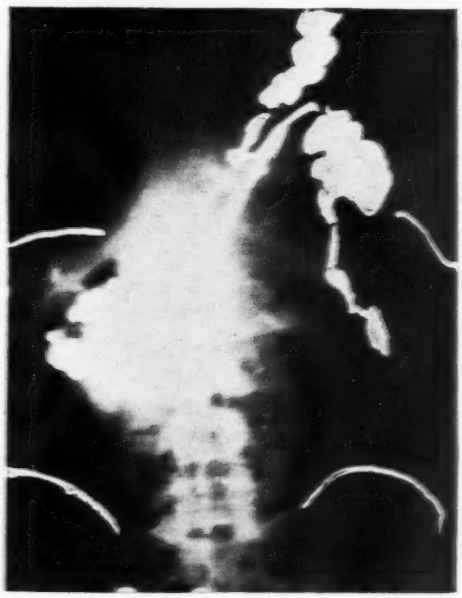

Fig. 4 (Case 3). Showing distortion of intestines, with displacement upward and to the left—24-hour examination—barium still in terminal portion of ileum.

eventration the contour of the shadow is smooth and sharply defined, while in hernia it is apt to be irregular and indistinct in places. In eventration the diaphragmatic movement is usually normal though diminished, while in hernia there is apt to be paradoxical movement, rising with inspiration and falling with expiration. The most important test is the ingestion of an opaque meal. In hernia, the barium entering the stomach will obscure the diaphragmatic contour and the lung markings at the base of the lung, and will be found to be above the normal diaphragmatic position. In eventration, the barium meal will quickly find its way to the most dependent portion of the stomach and not interfere with the diaphragmatic shadow.

The almost impossible task of diagnosing

diaphragmatic hernia by physical signs and history is evidenced in a case report by Ingals about twenty years ago, when, speaking before a medical society, he said: "An interesting case has recently come under my observation that I believe to be a diaphragmatic hernia, but several skilled diagnosticians look upon it as a pneumothorax. The question has not yet been settled, but in view of the symptoms and signs, I think the members of this society will be interested in each making a diagnosis for himself." About thirty men in all examined the patient, and their opinions differed so materially that no conclusion could be reached. In view of this great divergence of opinion based on the same physical findings, it is practically useless to attempt the differential diagnosis of such a condition without other aid. The physical signs are confusing, but with the diagnostic aid given by the X-ray, the differential diagnosis becomes relatively simple.

The prognosis in diaphragmatic hernia is not of the best. Strangulation occurs in about 15 per cent of the cases. It has occurred after the taking of large quantities of food or fluids, vomiting, straining at stool, parturition, falls, abdominal contusions, excessive exertion, etc. Volvulus of the herniated bowel has also been reported. As we have seen, one may live a full span of years and have no symptoms referable to the hernia. On the other hand, children may die in the first few hours of life or live but a few years. The other group, those who have survived their anatomical and physiological handicap, is the one with which we are mostly concerned. These patients suffer constantly or intermittently. They may be entirely unable to do work of any kind, or they may be but partially incapacitated. As there is no definite medical treatment—with the possible exception of more frequent and smaller meals—their treatment should be symptomatic. The difficulty must be overcome, if at all, by surgical means. When there is strangulation, surgical interference is imperative or death rapidly follows.

The symptoms in strangulation are the same as in other forms of obstruction, with the exception that instead of a distended abdomen it is likely to be retracted due to the absence of the bowel and stomach from the abdomen. The pain radiates through the chest, with the point of maximum intensity below the hypochrondrium. It is increased on inspiration. Some patients give a history of repeated minor attacks of strangulation; others die of shock during the first attack, or from peritonitis following gangrene of the strangulated bowel. These patients should be warned of the danger of strangulation, and that surgical aid should be sought immediately should any serious change in the condition occur.

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Diagnosis of cancer of the lung.—A review of the literature and a presentation of eight cases of primary intrathoracic neoplasm, correctly diagnosed during life and proved by autopsy. In two cases the roentgenogram furnished the data upon which the diagnoses were based.

By a proper co-operation between the clinician and roentgenologist in the interpretation of data observed from the history, physical signs, laboratory findings and especially the roentgenogram, the authors believe that most cases of cancer of the lung can and should be correctly diagnosed.

In the absence of cardio-vascular disease, the possibility of lung tumor should be considered, in any patient past middle life who gives a history of progressive dyspnea and persistent pain in the chest. For the purpose of elimination the roentgen ray is of prime importance inasmuch as it would be very rare to have negative roentgen findings in any case in which the tumor had progressed far enough to cause symptoms.

The roentgen shadows may be as varied as all the pathological combinations can make them, but most cases of primary lung tumor present roentgenograms that are quite unlike the more usual inflammatory processes with which they are so often confused. The most frequent incorrect clinical diagnosis is pulmonary tuberculosis. The characteristic mottled cloudiness of the parenchyma found in tuberculosis is itself pathognomonic. Rapid growth, an indistinct border, radiating projections from the tumor mass, multiple nodules, evidence of metastases to ribs or vertebræ, and pleural effusion would indicate malignancy.

Hodgkin's disease and lymphosarcoma may simulate carcinoma very closely. Blood study, the involvement of superficial lymph nodes, and the rapid therapeutic reaction to mild roentgen radiation should help to establish the diagnosis.

J. D. Camp, M.D.

The Diagnosis of Primary Intrathoracic Neoplasms. George F. Thomas and H. L. Farmer. Am. Jour. Roentgenol. and Rad. Ther., May, 1924, p. 391.

A STUDY OF THE LYMPHATIC SYSTEM IN ITS RELATION TO HIGH VOLTAGE X-RAY THERAPY[1]

By R. T. WILSON, M.D., and J. B. JOHNSON, M.D., Scott and White Clinic, TEMPLE, TEXAS

IT IS manifestly not within the scope of this paper to study the lymphatic system in its entirety, but to refresh your memory of the anatomy of the more common groups which we must radiate frequently; to recall the unusual routes that cancer may take at times; to discover if possible some anatomical reasons why the progress of malignancy may be checked in some localities while not in others, and, after studying the general anatomical formation of the lymphatics, to suggest what shape the field to be radiated in most cases should assume.

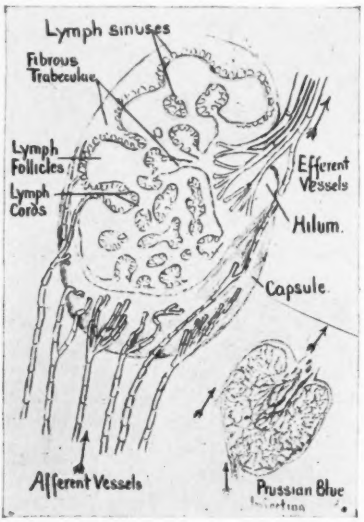

Fig. 1. Lymph node injected with Prussian blue, efferent and afferent vessels. Note a vessel going through the cortex of gland but not emptying into it. (Dr. Wm. Keiller, Galveston.)

Knowledge of the exact location of the terminal lymph vessels is prerequisite to efficient radiation. The distance separating malignancies from the terminal vessels is the distance from the blood stream. In other words, when malignant cells reach the central lymph vessels they will soon be emptied into the blood stream. The cisterna chyli is two to three inches (5 to 8 cm.) in length, lies under the right crus of the diaphragm to the right of the aorta, opposite the first and second lumbar vertebræ. The thoracic duct passes upward through the posterior mediastinum to the level of the fifth thoracic, where it turns to the left through the superior mediastinum to the root of the neck, passes slightly above the level of the clavicle, thence downward to the left innominate vein. Its tributaries are five main trunks, namely, one common intestinal, two lumbar and two descending. The intestinal trunk conveys lymph from the liver, stomach, small intestines, spleen and pancreas. The lumbar trunks carry lymph from the lower extremities, deep portions of abdominal and pelvic walls, large intestine, pelvic viscera, kidneys and genitalia. The descending branches convey lymph from the lower intercostal glands. In its course through the mediastinum the

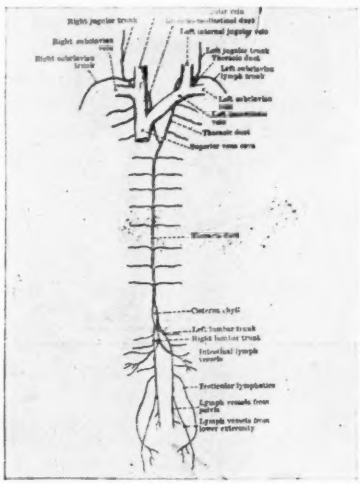

Fig. 2. Diagrammatic; thoracic duct and its tributaries. (Cunningham.)

[1]Read before the Radiological Society of North America, at Rochester, Minnesota, December 6, 1923, by Dr. J. B. Johnson.

thoracic duct is in close proximity to the esophagus as well as the other mediastinal contents.

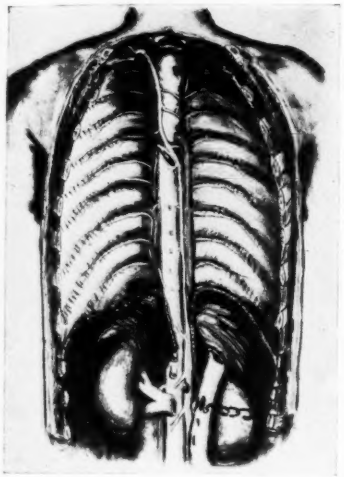

Fig. 3. Thoracic duct and its tributaries; its relation to mediastinal contents. The duct is in close proximity to the esophagus.

The right lymphatic duct, when present, is a short trunk (1 to 2 cm.) lying at the right side of the root of the neck. It is formed by the right jugular, right subclavium and right bronchomediastinal. When it is not present these vessels enter the right innominate vein separately. We should have no difficulty in remembering that the right lymphatic duct receives lymph from the right side of the head and neck, the upper right extremity, the entire right thorax and right side of the diaphragm. The lymph from the remainder of the body empties into the thoracic duct.

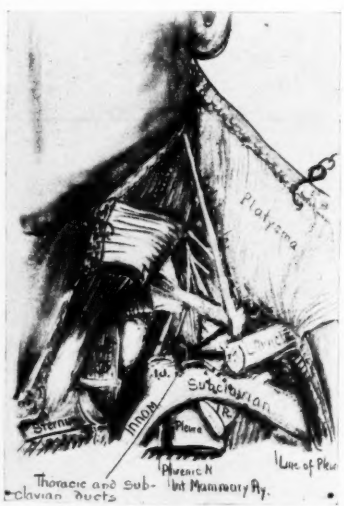

Fig. 4. Thoracic duct near its termination; some of its tributaries. (Dissection by Dr. Keiller.)

Fig. 5. Glands of neck in original dissection by Dr. Keiller.

The superficial lymph glands of the head

Fig. 6. Deep vessels and glands of head and neck over sterno-mastoid. (Cunningham.)

and neck, such as the submental, submaxillary, anterior and posterior auriculars, are the primary barriers against disease and are

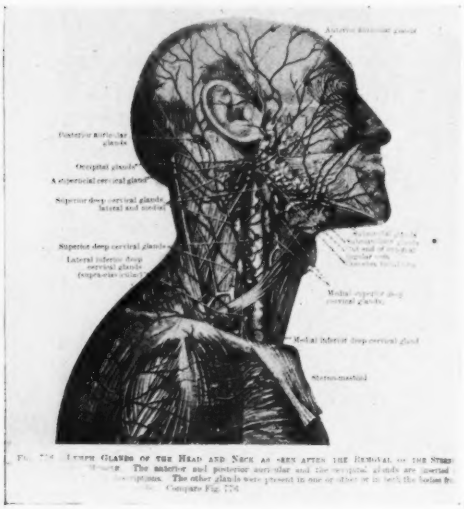

Fig. 7. Deep vessels and glands of head and neck; sterno-mastoid muscle has been removed. (Cunningham.)

usually enlarged first. They drain regularly into the superior and inferior deep cervicals. There is, in addition to this regular drainage, a direct connection with the inferior deep cervicals or supraclavicular glands through the superficial lymph vessels in front of the sterno-mastoid muscle. The

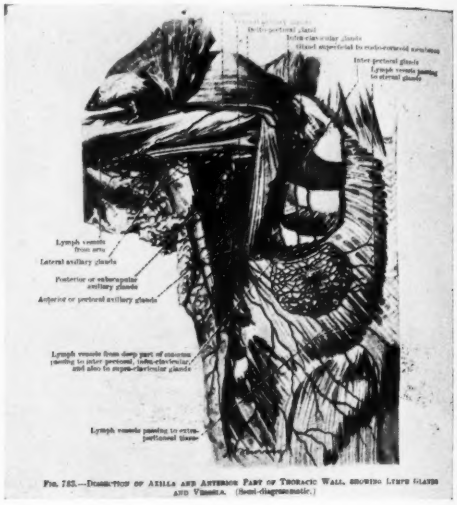

Fig. 9. Lymph vessels and glands of breast and axilla. (Cunningham.)

lymph in the submental glands flows to both sides of the neck. This collar of lymph glands extends over a distance of 15 to 20 cm., depending on the size of the individual.

The major outflow of the lymph from the breast goes directly to the anterior axillary glands, then to the central group. There are, however, other groups of vessels by which the lymph may pass from the breast. It may pass to the interpectoral glands, thence to the infraclavicular group; the lymph may pass directly into the infraclavicular glands. It may also drain in the skin into the supraclavicular glands. The vessels may also pierce the chest wall to the internal mammary glands along the costosternal margin. The opposite breast also receives lymph and some of the glands pass between the seventh rib and xyphoid process and pierce the abdominal wall to the extraperitoneal space.

The major drainage of the pelvis is through the regional lymph nodes to the iliac nodes, thence to the common lumbar glands and the cisterna. The vessels from the fundus of the uterus, the tubes and

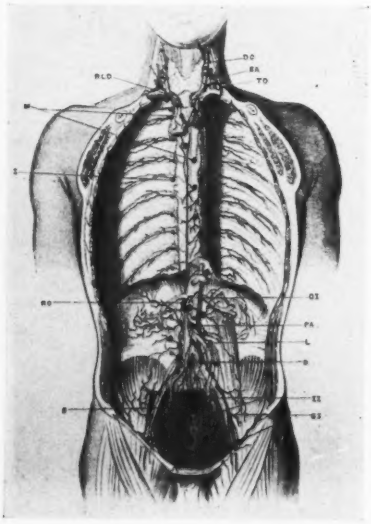

Fig. 8. Posterior mediastinal glands. Note close proximity to thoracic duct. (Cunningham.)

ovaries pass directly to the lumbar glands. The testicle has a separate vessel that empties high into the lumbar glands.

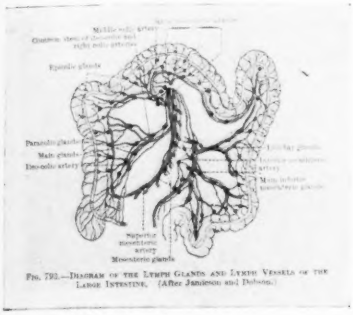

Fig. 10. Lymph vessels and glands of colon. (Cunningham.) Note that those of the right half join the mesenteric, while the left half go through the lumbar glands.

Of the lymph vessels of the female genital organs, the labiæ and the lower third of the vagina empty into the superficial subinguinal lymph glands. The cervix may communicate with the ano-rectal glands, thence to the sacral and lumbar. Most of the cervical glands empty into the base of the broad ligament and, therefore, into the external iliac. The vessels from the body usually go to the external iliac glands. Some of them may drain to the subinguinal nodes. Those from the extreme upper portions of the fundus, tubes, and ovaries, as above mentioned, go directly to the lumbar glands.

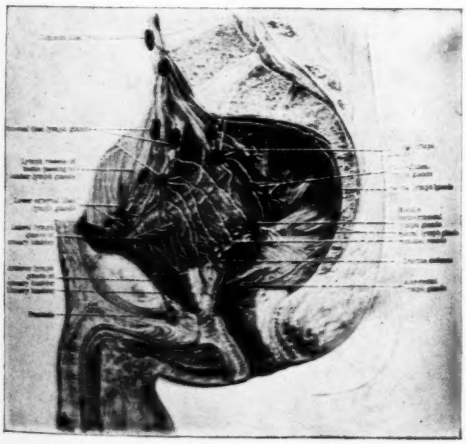

Fig. 11. Vessels and glands of lateral pelvic wall going to the iliac glands. (After Cunningham.)

The lymph vessels of the stomach and small intestines, as well as the right half of the colon, pass through the mesenteric glands to the thoracic duct by way of the common intestinal trunk. The left half of the colon drains to the lumbar glands.

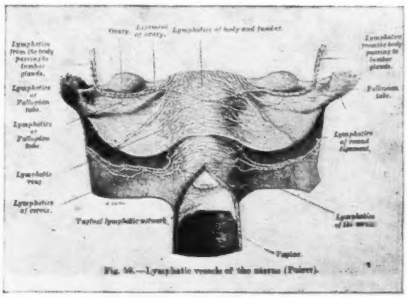

Fig. 12. Showing liberal vascular lymph drainage of uterus. (Pierre and Cuno.)

It has been our experience to see malignant growth involve, in regular succession, the chains of lymph glands draining a particular area, and we have also seen metastases which are difficult to understand unless the abnormal routes are borne in mind. For example, frequently we see lesions of the center of the tongue and lip metastasize to the deep cervicals on both sides. We have seen lesions of the head and neck involve the supraclavicular glands without evidence of disease in the intervening deep

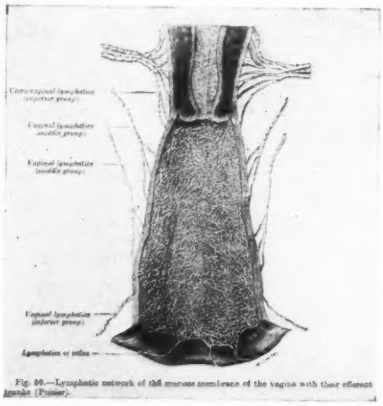

Fig. 13. Showing liberal lymph vascular drainage of cervix and vagina. (Pierre and Cuno.)

cervical glands, the metastasis occurring through the superficial anastomosing vessels over the sterno-mastoid muscle. We have seen carcinoma of the testicle involve the high lumbar glands early through the

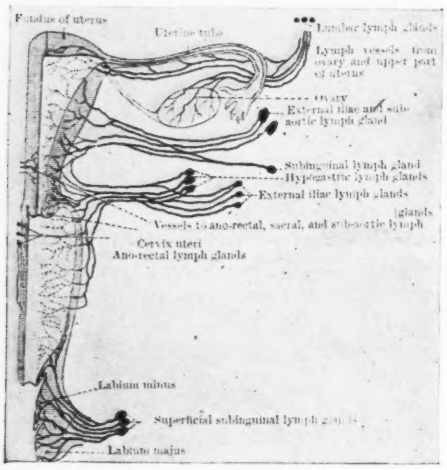

Fig. 14. Diagrammatic of female genitals, cervix and uterus, tubes and ovaries. (Cunningham.)

intervening lymph channel. We frequently see carcinoma of the esophagus, but are able to produce little change in the ultimate results, probably because the malignant cells quickly enter the central vessels. Bear in mind that cancer of the fundus, tubes and ovaries may also pass directly to the lumbar glands through a direct lymph channel, or the body of the uterus may metastasize to the subinguinal. We have all seen cancer spread to the lungs, even early, with little evidence of glandular involvement between the lungs and the primary lesion. Local blood stream metastasis may explain some of these or the disease may have reached the blood stream through the lymph vessels by means of the liberal anastomosis of lymph vessels skipping the lymph glands in its course. We have seen carcinoma of the cervix so extensive that it has spread onto the vaginal wall, reached the lower third of the vagina, and metastasized to the subinguinal lymph glands. The lymph vascular system connects directly with the serous cavities of the body, and the danger of extensive metastasis is very great, once malignant cells are free in these fluids.

Theoretically, if not practically, the farther a malignant growth is removed from the central lymphatic vessels and thus the

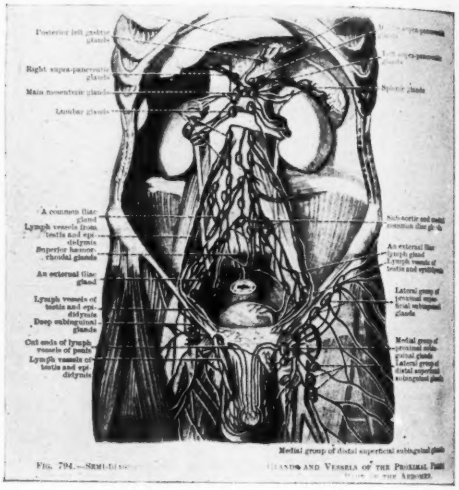
Right supra-pancreatic glands
Main mesenteric glands
Lumbar glands
Spleen
A common iliac gland
Lymph vessels from testis and epididymis
Superior haemorrhoidal glands
An external iliac gland
Lymph vessels of testis and epididymis
Deep subinguinal glands
Cut ends of lymph vessels of penis
Lymph vessels of testis and epididymis
Lateral group of femoral superficial subinguinal glands
Medial group of femoral subinguinal glands
Lateral group of distal superficial subinguinal glands
Medial group of distal superficial subinguinal glands

Fig. 15. Inguinal, iliac and lumbar glands. Note constant vessel to high lumbar glands from the testicle. (Cunningham.)

blood stream, the better is our opportunity of stopping the advance of the same. The greater the number of lymph glands intervening between the disease and the blood stream, since these are natural barriers, the better is our opportunity of checking the progress. Carcinoma of the cervix, breast, as well as head and neck, have more liberal natural barriers than the same disease in the esophagus. The stomach and small intestines have an abundance of natural barriers but are open ports for digestive absorption as well as liberal venous circulation through the portal vein; lesions in these organs are therefore likely to metastasize early, especially in young persons. The lymph vessels are most active in the young, less active or partly closed in old age, therefore all malignancies are more dangerous in the young. Lymphatics of the colon probably are materially blocked in later life. Dr. W. J. Mayo has told us that carcinoma of the colon is not necessarily inoperable, no matter how extensive. In

our judgment this should be true, more especially in the left half than in the right, because the vessels of the right half pass directly to the common intestinal trunk, which are open ports for digestive absorption, while in the left half of the colon the lymph vessels detour via the lumbar glands.

Reviewing now the glandular fields, those of the head and neck extend from the auricular and occipital regions to the clavicle; the breast from the clavicle to the ensiform and from the axillary fold to the opposite breast; the cervix and uterine field are continuous from the symphysis to the first and second lumbar vertebræ. The fields all extend over a distance of more than six inches in most individuals.

By radiating a 15 cm. square opening, according to the excellent works of our physicists, we get the maximum intensity of secondary irradiation. With this fact we have no contention, but from our anatomical study of the fields to be radiated and actual measurements on many patients we believe that the 15 cm. opening is inadequate, especially in pelvic cases. In most patients an opening of 20 or 30 cm. is necessary, and by making the opening narrower we can give more areas without overlapping. It is our practice to use a diaphragm at such a distance from the patient on all three positions of our machine that an area of 10 by 25 cm. will be radiated. This opening will allow sufficient length to cover the glandular area and sufficient areas to deliver any depth dose desired.

In view of these facts let us study our cases individually, the duration of the disease, the rapidity of its growth, the extent of its involvement, its nearness to the central lymph vessels, as well as the likelihood of its already having spread to the blood stream, together with the type of cell changes present and their grade of malignancy. In most cases we will be able to give to the patient the proper prognosis and under these conditions we will in a high percentage of cases check the progress of the disease when we expect to and not be holding out hopes for the patient's recovery when there are none.

In closing, we wish to thank Dr. William Keiller and Dr. H. O. Knight for their courtesy in lending the drawings, and Dr. G. C. Lechinger for photographing them. These men are all members of the medical staff of the University of Texas.

Tonsil therapy. — The cellular elements which are characteristic of lymphoid tissue have a lower degree of resistance to the X-ray than the surrounding normal connective tissue structures. This has been substantiated by microscopic studies of tissues subjected to the X-ray in therapeutic amounts. Under bombardment by the ray, the lymphocytes in cases of leukemia and in Hodgkin's disease undergo a disintegration or destruction and absorption, while the supporting tissue contracts, thus decreasing the bulk of the gland or tissue. The numerous lymph follicles of the tonsil which are embedded in a surrounding diffuse adenoid tissue can properly be expected to undergo a recession in size and activity, provided the correct dosage of ray be applied to them. Extratonsillar tissues in the immediate neighborhood also contain lymphatic structures in considerable amount, and these, too, are favorably influenced by the action of the X-ray at the same time, inasmuch as the ray can not be entirely limited to the tonsil itself, even if it were desired to do so.

Murphy, Witherbee, Craig, Hussey and Sturm, basing their experiments on the original observations of Heinecke, substantiated his findings. They conclude that lymphoid tissue is more highly susceptible to the X-rays than any of the structures of the body excepting the sex glands, and that by suitable X-ray exposures it is possible to remove almost all lymphoid tissue without inducing detectable changes in other organs or tissues.

Blaine made no selection of cases. Most of the cases exhibited material improvement, ranging from moderate to complete relief, while in several instances no material change was manifested.

The treatments are administered once every week to ten days until a series of eight are given, after which a period of observation of six to

(Continued on page 249)

OUR MISTAKES[1]

By E. H. KESSLER, M.D., St. Louis

THE word "mistakes," in this paper, means errors in opinion or judgment. Human nature is such that errors will occur. Mistakes date back to the beginning of the human race. Adam and Eve made a mistake, with consequences greater than the mistakes of a roentgenologist whose wrong interpretation might cause a needless opening of an abdomen. Mistakes are found in all walks of life. An observing person is not surprised to note mistakes made by others, unless they be glaring ones.

I was prompted to present this paper both by my own mistakes and by the observation of others' mistakes, as shown in patients coming under my care. You might not be interested in my errors, but errors are also made by some of the best-known men in the profession. I will mention only two instances. They could be multiplied a hundredfold.

Several years ago I was present in a prominent clinic while the roentgenologist was making gastro-intestinal examinations. The patient, a doctor, ex-president of the A.M.A., came to verify the diagnosis of cancer of the stomach. There was a filling defect on the greater curvature. Palpation evened the defective curvature without pain. The cause of the uneven appearance was gas in the colon.

A second instance was a paper presented last year before a convention of roentgenologists, illustrating that a Haudek niche does not always mean ulcer of the stomach. I think five patients were operated on, and no ulcer was found. Just now I am not interested in whether a Haudek niche means ulcer or not. I am mentioning this paper because the illustrations which were used to show that a Haudek niche does not always mean ulcer, were illustrations of absolutely normal gastric waves.

These two instances show glaring mistakes in simple cases. We should not put them down as due to ignorance. The men who made them stand high in their work.

Let us analyze our own mistakes.

Case 1.—A very stout young Jewess was referred for correction of excessive bleeding from the uterus caused by uterine fibroids. Four treatments of 100 K.V., 5 ma., 5 mm. aluminum and glass and sole leather filter, 6 minutes at 9-inch skin anode distance had been given at intervals of four weeks. The patient had missed the last period two weeks previously. A careful examination of the skin showed tanning, but it looked as healthy as any I had seen. As the patient came a great distance, and because she insisted, we gave a fifth treatment. My nurse said, "Let's put in an extra filter for good luck." We did. A treatment similar to the others was given. All conditions were verified by the nurse and myself. The last exposure was followed by a severe burn with intense suffering, which required a large resection.

Case 2.—A woman of slight build, about thirty-five years old, was referred for excessive uterine bleeding. She had three treatments of 100 K.V., 5 ma., 6 minutes, 5 mm. aluminum, glass and sole leather filter, 9-inch skin anode distance. Each treatment was given after an interval of four weeks. She returned for a fourth treatment. All conditions were supposed to be the same as at former treatments. Upon verifying the filters at the end of the treatment, we found all filters except the sole leather and glass, absent. After one year of intense suffering from an extensive burn and acute enterocolitis, the patient was operated on and recovered.

Case 3.—This case is cited to illustrate mistakes which may be made in giving information to the patients.

A very stout man, forty-eight years old, about 5 feet 6 inches tall, and weighing 240 pounds, came for examination. He

[1] Read before the Radiological Society of North America, at Rochester, Minnesota, December, 1923.

gave a long history of gastric distress. His color was florid and he had the appearance of good health. A barium examination showed about five inches of the greater curvature of the stomach defective. A mass could be palpated, corresponding in position to the defect seen. The patient was kept under observation, and a retest showed the existence of the same condition as was shown at the first examination. A diagnosis of carcinoma of the stomach, probably inoperable, was made. The patient's general condition, the appearance of normal health, and the prognosis of inoperability seemed to make it necessary that another examination be made, by some one other than myself. The examination was made by a man well and favorably known to all of our elder members. I, personally, have great respect for his ability. The diagnosis which was given the patient said nothing about the stomach involvement and advised an operation. The patient was sent home after recovering from the immediate effects of the operation. Before going home he was told that a slight operation had been done and a small part removed. A great deal was said, by the patient, concerning my diagnosis. I asked the operating surgeon to inform me of the findings. The following is a part of his report: "The cancer had matted together the greater part of the great omentum, a large section of the transverse colon and a section four or five inches long of the greater curvature of the stomach, and all so infiltrated and attached so firmly to the anterior abdominal wall that we felt it would be impossible to remove the tumor. The abdomen was closed without drainage."

Fig. 1 (Case 5). Right kidney high in the usual position, patient lying on back during exposure.

Fig. 2. Same patient, standing during exposure.

The patient, eight months after the operation, had a weight loss of about one hundred pounds and was losing regularly. Until he died recently he continued to tell his friends what a mistake I made.

Case 4.—The patient, a woman, thirty-nine years old, was referred for indefinite gastric symptoms. The findings were normal until we reached the terminal ileum and cecum. The cecum was not movable and a supposed coiled appendix was seen, with moderate pain on palpation. The following report was given: "A normal condi-

tion exists until we reach the cecum. A coiled appendix, painful to palpation, is noted." When I handed the report to the surgeon, he said he had operated on the patient about fifteen years ago, but did not remember the cause. Several minutes later he came in saying, "Dr. Kessler, you will have to change that report. She says she has the appendix at home in a bottle." What I saw, if I am not mistaken, were distorted haustral markings due to adhesions.

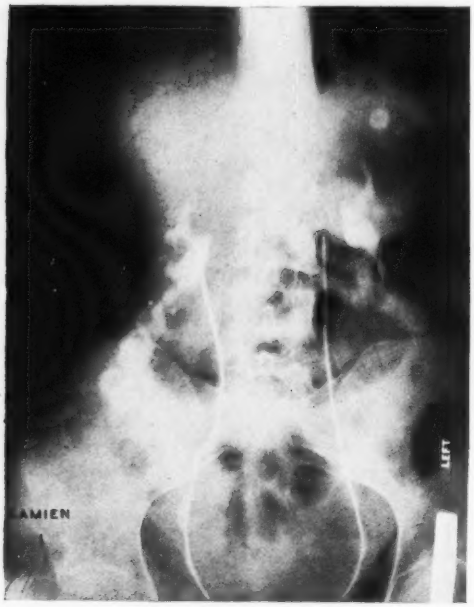

Fig. 3 (Case 7). Injected kidneys, right kidney high. Gallstones showing below injected kidney pelvis. One stone high in the left lobe of the liver.

Case 5.—We will pass over the symptoms. We were told to locate the kidneys. Our report read, "Kidneys are of normal size and in normal position." Some days later a pyelogram of the kidneys showed them high in normal position. The surgeon thought that the mass which was felt, at times, low in the right quadrant, might be a kidney and not a fecal mass. Another pyelogram was made and plates were taken, with the patient on his back (Fig. 1) and with the patient standing (Fig. 2). The plate in the prone position showed the kidneys high in the usual position. The plate, patient standing, showed the right kidney midway over the sacral joint.

Case 6.—A boy, twelve years old, had symptoms which made examination of the urinary tract seem necessary. The patient's father brought two very good plates, made in another city, showing what his doctor said was a stone in the urinary bladder. The boy's penis was short, and the exposure was made in such a way as to make a rounded shadow of the penis, which was said to be a stone in the bladder. A nail fastened to the penis and strapped to one side removed the supposed stone.

Fig. 4. Same patient, exposure for gallstones.

Case 7.—Mrs. C., sixty-five years old, about fifteen years ago began to have digestive disturbance, with pains in the back and between the shoulders. During the last two years the symptoms had increased and urination had become frequent, with constant desire to void. The urine contained blood and pus. A rolling, freely movable, rounded mass was felt in the right side, about the level of the crest of the ilium, and was supposed to be the right kidney. A pyelogram showed the kidney in the normal

position with a normally outlined pelvis. Shadows were seen lower than the kidney and their form led me to suspect gallstones. A plate taken for gallstones showed six shadows well to the right and very low. The gall bladder was in an unusual position. There was one stone shadow well to the left of the median line, high in the upper quadrant. The lower lobe of the liver was long, reaching well down in the lower right quadrant. A diagnosis of gallstones and cystitis was recorded. The operative findings were a low-hanging, freely movable gall bladder, with stones, and a stone in the left lobe of the liver. The kidneys were normal in form and position. There was another mass in the cecal region, with the cecum and terminal ileum involved and adherent to the urinary bladder. An attempted removal of the carcinomatous mass showed a sinus into the urinary bladder. The writer feels that his entire duty was done, as an examination of the gastrointestinal tract was suggested but refused.

Checking and rechecking our examinations will lessen our mistakes, but I do not believe errors will entirely disappear. To present this paper gives me no pleasure. Looking over our mistakes, we experience a feeling of smallness and some shame. We have tried to benefit by the errors, both of omission and commission. Mistakes made by physicians reflect on the entire profession. After a long succession of correct diagnoses we are prone to feel as though floating in the atmosphere. A demonstrated error again brings our feet firmly to the floor.

(Concluded from page 245)

eight weeks is required to determine the amount of improvement obtained. In some refractory cases a subsequent radiation is given to complete the treatment. The softer the tonsil, the more marked was the improvement, and *vice versa*, and children respond more quickly than do adults.

The X-ray formula consists of five milliamperes at one hundred kilovoltage (sphere gap), 30 cm. focal spot distance, through 3 mm. of aluminum filter, for five minutes, using a circular lead diaphragm, opening of 5 cm. in diameter at 15 cm. from the target. The patient lies prone, with head turned sharply to the right or left, according to which tonsil is being irradiated, and both sides are irradiated at each treatment. The central X-ray beam is directed to pass into the side of the neck just posterior to the angle of the jaw. This will include the tonsils, adenoids, lymphatics, etc., of the nasopharynx. No sheet lead or other similar protection is used over the patient's head, this being unnecessary when modern metallic X-ray tube stands are used, because ample protection is afforded against undesired cellular reaction of the surrounding skin, not over the tonsil, being treated.

Roentgen-ray therapy is indicated in the following:

Those who refuse operation; obviously hypertrophied tonsils of children, slightly but obviously reddened as a result of bacterial activity, but exclusive of those that are markedly reddened and congested and accompanied by systemic manifestations; patients past middle life suffering from a mild or severe arteriosclerosis, in whom an undesired hemorrhage may follow tonsillectomy; patients whose tonsils are embedded in infected tissue, in whom an operative removal may cause dissemination of septic emboli into the lymph and blood streams, sometimes resulting in lung abscess, septicemia, endocarditis, etc.; patients whose adjacent lymphatic structures (not removable by operation) are markedly infected; patients suffering from chronic cardiac lesions, Bright's disease, diabetes, exophthalmic goiter, chorea, rheumatism, hemophilia, asthma, tuberculosis, status lymphaticus, or any other condition which has lowered the general resistance, and, finally, those suffering from recurrent attacks of pharyngitis after surgical removal of tonsils and adenoids.

It is certain that the intensively diseased tonsil requires a more vigorous intervention rather than the slower X-ray method. The other cases should be given radiation before resorting to forceful removal.

SOLOMON FINEMAN, M.D.

X-ray Therapy of the Infected Hypertrophic Tonsil. Edward S. Blaine. Annals of Otology, Rhinology, and Laryngology, June, 1924, p. 534.

REPORT OF TWO CASES OF CALCIFIED ATHEROMA AT THE ARCH OF THE AORTA[1]

By KEITH T. MEYER, M.D., Roentgenologist of the Walker Hospital Clinic, EVANSVILLE, INDIANA

THE finding of a calcified atheromatous patch in the wall of a saccular aneurysm of the descending aorta just beneath the arch, led me to review the literature, as to the frequency of this finding radiographically. The number of reported cases is exceedingly few. Koehler made an X-ray diagnosis of calcium deposits in the aortic arch in two patients, and demonstrated the plates at the Roentgen Congress in 1911. A. E. Garrod and G. Evans made a diagnosis of atheroma of the arch of the aorta by means of a skiagram. The postmortem examination was made twelve hours after death, confirming the diagnosis. The whole of the aorta, from its origin to its bifurcation, was in a condition of extreme atheroma with numerous calcified plaques. Billiard was able to show on an X-ray plate a case of particularly complete visibility of the thoracic aorta. C. R. Scott, by means of a radiograph, demonstrated a marked sclerosis of the abdominal aorta. E. Boden reports that in examining thirty-six patients, between the ages of fifty and seventy, he was successful in nine cases in demonstrating calcium deposits in the aorta by means of the radiograph. Only recently, Berkheiser and Ridlon demonstrated several radiographs of calcareous degeneration of the lumbar and dorsal aorta.

The extreme frequency of this finding postmortem, with the exceedingly few times that it has been possible for me to report that the aorta showed definite calcification, made me feel that I was not discovering everything that the radiographic and radioscopic examination of the chest and abdomen was revealing. Replies received from a number of the leading roentgenologists, in answer to my query as to the frequency of this finding, have led me to believe that others have not been much more successful than I have been. Thinking possibly that the clinician might be interested in the discovery of this pathological process, antemortem, communications were addressed to a number of leading clinicians, with the query as to what clinical significance they would attach to a radiographic report which advised them that the aorta showed a definite calcareous degeneration. Not one seemed to consider it of any import. Several in their replies said that they would consider it with considerable skepticism.

Pathologists are very indefinite as to the exact chemical steps in the process which results in a deposition of calcium salts in the aortic wall. Adami, in "Principles of Pathology," states that it is not known. The immediate etiology of the calcification appears fairly simple. The intima gets its blood supply from the blood stream. It has no vessels of its own, nor has the inner media. The thickened fibrous plaque, then, by its increase cuts itself off from the blood; it degenerates—the lime salts are deposited. But all agree that the death of tissue is the first prerequisite. Syphilis, by its primary degeneration of the media, with a compensatory fibrosis of the intima, simply starts the same sequence of processes as may actually occur from physiological reasons resulting in the senile type. To me, arteriosclerosis is a unit process, whether started by syphilis or by over-strain and consequent exhaustion of the musculature.

In all gastro-intestinal examinations and in chest examinations, I have made it a routine procedure to study the aorta carefully for definite evidence of sclerosis. I have noticed that the density cast by the thoracic aorta varies markedly in different individuals; not only with the variations in age, but also in individuals of the same age and habitus. Vaquez states that

[1] Read before the Vanderburgh County (Indiana) Medical Society.

in the adult the shadow of the ascending aorta and the penumbra of the descending aorta are sometimes difficult to dissociate; at forty, and especially after sixty years of age, the ascending portion is much denser and cuts into the clearer shadow of the descending aorta. The contrast of densities is even more marked in case of an atheromatous artery. He believes a diagnosis of aortitis should be made when there is opacity of the vascular shadow coincident with spots and dense patches due to areas of calcareous infiltration and the more or less complete absence of vascular pulsation, indicating thickening and rigidity of the artery. He finds that the essential subjective phenomenon which characterizes these cases of aortitis consists in more or less violent pain. This type of aortitis resists treatment, and it is not uncommon to note in the course of the radiological examinations, made at intervals of several months, the progressive invasion of the aorta by sclerosis, the appearance of new opaque spots and the gradual increase in the diameter of the vessel. This calcific degeneration must result in marked circulatory changes, as a result of the loss of expansibility and contractibility. Ridlon and Berkheiser state that pain must arise mainly from circulatory changes, changes that result in loss of expansibility and contractibility, and hence in ischemia of the musculature. Seeking diligently for the cause of backache among their cases, they have been able to demonstrate, at least to their own satisfaction, calcareous degeneration in both the thoracic and abdominal aorta, without other roentgen-ray evidence of pathologic conditions of bone or joint as a cause of backache.

In conclusion, therefore, I believe that careful radiological attention should be directed to the thoracic and lumbar aorta, in order to determine evidences of increased visibility of the aorta, in all cases of obscure abdominal and thoracic pain. The following two cases are presented to show that calcification in the aortic arch can be successfully demonstrated on a radiograph. It is realized that in these two cases, the calcific deposition is only an incidental finding—and of minor clinical import. The two cases follow.

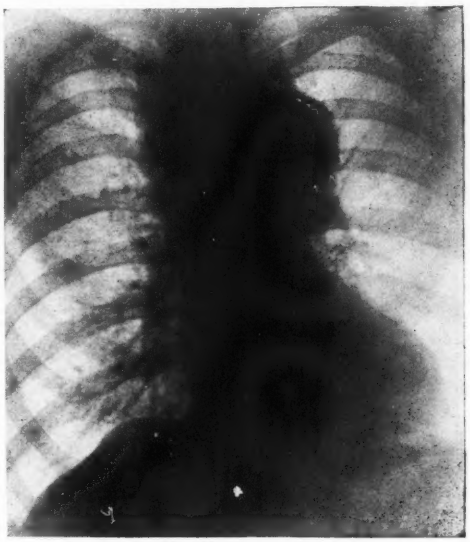

Fig. 1. CASE 1. Calcified plaque in wall of saccular aneurysm of the aorta just beneath arch.

Case No. 1. The patient, white, male, age 48, referred for substernal pain and oppression, dyspnea, cough, and palpitation.

Past history. Usual childhood diseases. Sore on penis at 23. Otherwise healthy and well, until three months ago.

Family history. Negative.

Marital history. Married at 26. Wife apparently healthy and well. One miscarriage at four months. No children.

Social habits. Smokes and drinks moderately.

Present history. While lifting a box felt a sudden severe pain in chest. Since then has been bothered with severe substernal pain and dyspnea on the least exertion. The dyspnea has been getting progressively worse, until now he is unable to walk a block without being compelled to rest. Has a non-productive, brassy cough. No dysphagia.

Physical examination. Reveals a well-nourished man. Facial expression suggests one who is greatly worried.

Head. Occasional headaches.

Ears, nose and throat. Negative for gross pathology. *Eyes.* Pupils equal; accommodate to light and distance. *Teeth and gums.* Clean and in good condition.

Fig. 2, CASE 2. Calcareous degeneration in aortic arch.

Neck. Number of small, hard glands in posterior cervical triangle.

Chest. Nothing definite to inspection or palpation. *Percussion.* Shows marked increase in substernal dullness to left. *Auscultation.* Systolic aortic murmur. No definite bruit heard.

Abdomen. Negative for gross pathology; number of small, hard glands in inguinals.

Genito-urinary. Negative for gross pathology; scar on prepuce.

Extremities. No inequalities of the radials. Delayed femoral pulsations.

Reflexes. Negative knee jerks, Babinski, Oppenheim and Rhomberg.

Laboratory examination. R. B. C., 4,400,000. W. B. C., 7,000. Differential. Pol. 66. S. L., 28. L. L., 6. Hemoglobin, 75 per cent (Talquist). *Urine.* Albumin-negative. Sugar-negative. Occasional hyaline cast. Blood Wassermann 4+. B. P., 155—83.

Radiographic and radioscopic examination of chest. Shows a large semi-circular, sharply defined shadow, projecting posteriorly from the descending aorta just beneath arch. The pulsations are synchronous with the systole of the heart and laterally expansile in character. The heart is pushed downward. In the superior border of the wall of the aneurysm can be seen a crescentic shadow, size 10 mm. by 1 mm., which moves uniformly with each pulsation of the shadow.

Diagnosis. Saccular aneurysm of the descending aorta, just beneath arch, with calcified plaque in wall of superior border.

Case No. 2. Patient, age 50, male, bookkeeper, presented himself with severe cough, with profuse, fetid expectoration, temperature, loss of weight and strength, anorexia, etc.

Past history. Usual childhood diseases, no after-pathology. Typhoid fever in 1900; pneumonia in 1918.

Family history. Mother died of pneumonia; apparently otherwise healthy and well. Father, living, bothered considerably with stomach trouble. Two cousins have tuberculosis, pulmonary.

Present illness. Dates back to attack of pneumonia in 1918. Has never been strong since, and has had a severe, productive cough. In June, 1919, had a severe hemoptysis; lost nearly a quart of blood. In November, 1922, had another severe hemorrhage from the lung, losing about a pint of blood this time. At times runs a temperature of 100 to 101½, accompanied with chills. Some soreness in chest. Has dyspnea at times. At times, in coughing, has brought up several calcareous masses, size of a cherry.

Head. Occasional headache. No sore throat.

Gastro-intestinal. Marked anorexia at times. Bowels regular.

Genito-urinary. No dysuria, pyuria or hematuria.

Extremities. Feet never swell. Marked clubbing of fingers.

Physical examination. Patient markedly emaciated. At one time weighed 150 pounds; present weight, 110 pounds.

Head (eye, ear, nose and throat). Negative for gross pathology.

Mouth. Teeth and gums in poor condition. *Tongue.* Markedly coated.

Neck. Small, fairly hard lymphatic glands in anterior and posterior triangles of neck; also supraclaviculars.

Chest. Expansion of chest, markedly limited on right side; good on left side. Vocal fremitus increased over right lower lung. Impaired resonance over lower half of right lung; numerous râles throughout right lung and in left base, posterior. Bronchial breathing over right lower lung.

Cardiovascular. Heart not enlarged, no murmurs. Marked sclerosis of peripheral blood vessels.

Abdomen. Negative.

Genitalia. Normal.

Reflexes. Normal.

Laboratory examination. R. B. C., 3,500,000. W. B. C., 7,000. Differential. Pol. 64. S. L., 26. L. L., 10. Hemoglobin, 65 per cent. B. P., 178-128. Urine at times had had considerable albumin, with hyaline and granular casts. Wassermann, negative. Sputum, tubercle bacilli present at this examination.

Radiographic (stereoscopic) and fluoroscopic examination of chest. Superior mediastinum shows widening, with widening of the aortic arch. There is a calcified degeneration of the arch of the aortic wall. Heart, drop type, action good. Diaphragms: Left, fair excursion; right, poor. Pleura: Right, shows thickening; left, negative. Apices: Both cloudy, with fibrotic infiltration in both apices, particularly right. Hila shows marked peribronchial thickening. Parenchyma shows fibrocaseous infiltration in right upper lobe and an irregular consolidation of right lower lobe. There are a number of calcified masses in right hilus, size of a cherry (broncholiths).

Diagnosis. Chronic pulmonary tuberculosis of both lungs, particularly right lung, extensive and active. Abscess, lower right lobe. Broncholiths, right lung. Calcific degeneration of aortic arch and descending aorta.

SUMMARY

1. That sclerosis and calcific degeneration of the aorta can be successfully determined by radioscopic and radiographic examination.

2. That this finding is of sufficient clinical importance to be considered as a cause of thoracic or lumbar pain.

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DEPARTMENT OF RADIODONTIA

UNDER THE SUPERVISION OF BOYD S. GARDNER, D.D.S.,
ROCHESTER, MINNESOTA

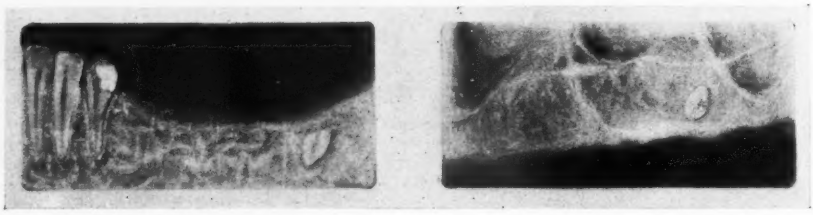
A METHOD OF LOCALIZING ROOTS OF TEETH, RESIDUAL GRANULOMAS, OR FOREIGN BODIES

By BOYD S. GARDNER, D.D.S., Section on Dental Surgery, Mayo Clinic, ROCHESTER, MINNESOTA

THE removal of a root of a tooth, or a foreign body, is sometimes difficult, especially if the object to be removed is distant from any landmark. Such difficulty is accentuated in supposedly edentulous mouths. Failure to determine the exact location may result in the loss of valuable processes and, in the upper jaw, of the opening into the antrum. In many instances, a patient may continue to wear the same denture if the root can be removed without loss of very much process; on the other hand, without localization, so much process may be destroyed as to make it necessary to rebase or build a new denture.

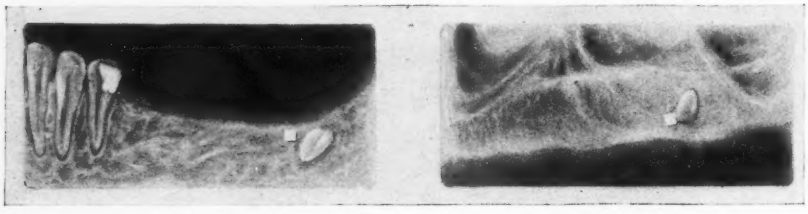
Figures 1, 2 and 3 illustrate the method of localizing roots and foreign bodies. A modified Boley gauge is used in conjunction with a small piece of metal (a clipping from a metal back of a dental X-ray film) and a piece of adhesive tape.

While the gauge is being used to make



a *b*

Fig. 1 (*a*). Drawing made from a roentgenogram showing a root in the region of the lower second molar. In this case, the bicuspid can be used as a fixed point from which the exact measurement in millimeters to a point determined by a piece of metal attached to the gum by use of adhesive tape, may be ascertained. The metal is placed as near to the root as the operator is able to judge. It is necessary to use only enough adhesive tape to hold a piece of metal the size of a pin head. Accordingly, four to six square millimeters of tape are sufficient. (*b*). A condition similar to that in the maxilla is shown. Since there are no teeth, the frenum is used as the fixed point.



a *b*

Fig. 3 (*a*) and (*b*). Drawing made from a roentgenogram, showing the relative position of the metal and root.

the measurement, the number of millimeters is noted, and the same or a similar gauge is used during the operation. Thus it is possible for the operator to make an incision and lay back a flap that will expose the process directly over the root or foreign body to be removed. The advantage of the adhesive tape is in holding the metal to the gum without inflicting pain. If the measurement is made after the field of operation has been anesthetized, the method has no advantage over the older methods of inserting something metallic directly into the gum.

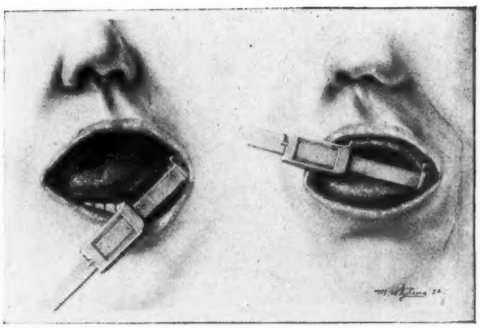


Fig. 2 (*a*). The Boley gauge measuring the distance from the tooth to the point marked by the metal attached to the adhesive tape. (*b*). The gauge used in the same manner, but the measurement is being taken from the frenum to the piece of metal.

PRIMARY CARCINOMA OF ANTRUM: REPORT OF CASE

By THEODOR BLUM, M.D., D.D.S., New York City

A WOMAN, aged sixty-five years, who complained chiefly of a swelling in the left canine fossa, was examined June 20, 1923. About four weeks before, the patient had been struck on the left side of the face by a rubber ball. She had had no discomfort for about two weeks; her face then began to swell on this side. An artificial denture irritated the slightly painful swelling, but when the plate was not worn there was no pain.

Examination revealed marked swelling in the left canine region. The skin and subcutaneous tissues were unchanged and movable over the swelling. On deep palpation a mass, soft and slightly painful to the touch, was found; there was a suggestion of fluctuation. The mass was approximately 3 cm. in diameter, and firmly attached to the surrounding tissues. There was an edentulous maxilla, and the left upper fold was entirely obliterated. The swelling extended from the region of the lateral incisor back to the region of the third molar. The mucous membrane was intact. X-ray examination revealed an entire loss of bony structure in the left maxillary premolar and molar region, as compared with the normal right side (Figs. 1 and 2). The following is the X-ray report of the sinuses; the posterior anterior view of the sinuses may be seen in Figure 3. The left frontal is extremely large, the right is of average size; both are very deep, with a thin anterior wall. They show a mild thickening of the

Fig. 1. Carcinoma of the left maxilla, originating from the wall of the antrum.

membrane. The ethmoids are moderately involved in the turbinate region. The cells of the capsule seem clear. The left antrum is extensively involved, being completely filled with granulations. The right antrum and the sphenoids are clear.

Fig. 2. The right maxilla.

A clinical diagnosis of primary carcinoma of the left antrum, and a laboratory diagnosis of squamous-cell carcinoma were made. The patient was treated by radium and then operated on. There was no recurrence up to June 5, 1924.

Comment. A soft swelling, either on the buccal or palatal side of the maxilla, covered with normal mucous membrane, practically painless, even with a suggestion of fluctuation, and a typical loss of bone as seen in intra-oral X-ray films, in a patient past middle age, is typical of early primary carcinoma of the antrum. In considering the differential diagnosis the X-ray examination is of great assistance and will readily exclude cysts as well as other tumors. The X-ray examination of the sinuses is misleading, as a typical appearance of the region involved can be seen only on a small film placed intra-orally.

Fig. 3. Carcinoma of the left antrum.

The author believes that surgery alone should be resorted to, only if an operation can be performed without crippling or disfiguring the patient. In all other cases radium treatment followed by surgery should be employed. If possible, the radium treatment and surgery should be under the direction of one person.

CASE REPORTS AND NEW DEVICES

A CASE OF HAIR BALL

By W. M. CARR, M.D., Winnipeg General Hospital, MANITOBA, CANADA

CASE No. 1. Female patient, age 35, wife of farmer, Western Canada. *Entrance Complaints:* (1) Dyspepsia; (2) Mass in abdomen.

Present Illness: For the past month and a half patient has had epigastric discomfort following meals, which, unless she rested, would terminate in vomiting. In

Fig. 1, Case 1.

this event the vomitus consists of a yellowish fluid containing dark particles. She would frequently be awakened in the early morning by this epigastric distress and was relieved by taking food or baking soda. Pronounced constipation. The above-noted symptoms are less pronounced when she takes plenty of rest. She has had dyspepsia similar to this last attack, but not so severe, each spring for the past three years. A large, freely movable mass is palpable in the mid-abdomen.

Past Illness: Patient had bilious attacks up to the age of seventeen, which were fol-

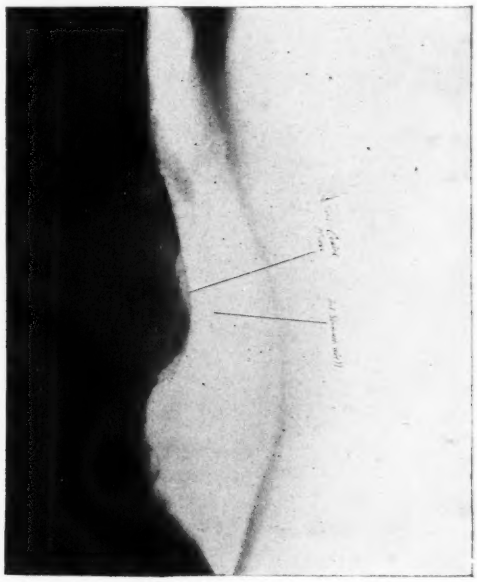


Fig. 2, Case 1.

lowed by vomiting. At ten years of age the attack was very much worse than usual, there being much pain and vomiting for a period of one week. Pleurisy eight years ago, without effusion.

X-ray Findings: A large, freely movable stomach containing a large, freely movable mass. A pouch on greater curvature of body of stomach. Pedunculated benign tumor or hair ball.

Operative Findings: Large hair ball. Pouch on greater curvature, from apex of which an adhesion extends to left lateral parietal peritoneum.

CASE No. 2. *Postmortem Findings:* The body is that of a poorly developed, very emaciated man. Rigor mortis and post-

mortem staining are not marked. There are no external signs of injury.

INSPECTION OF CAVITIES

Pleural Cavity: The left pleural cavity contains a considerable quantity of yellow fluid with flakes of fibrin floating in it.

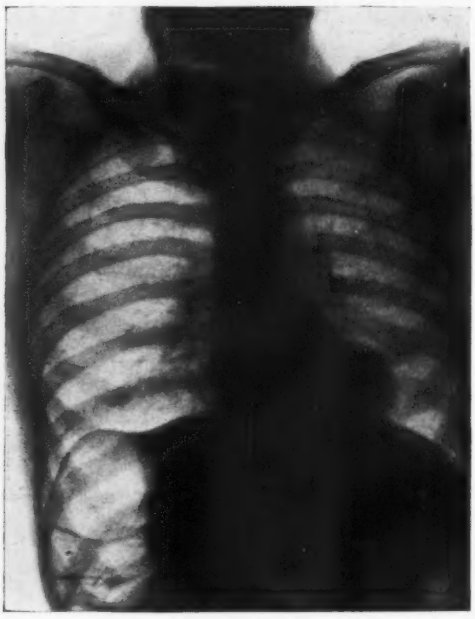


Fig. 3, Case 2.

The visceral pleura is covered with a thick, fibrinous exudate. There are no adhesions. The lower lobe of the left lung is quite solid, but in a state of red hepatization. The upper lobe is congested and edematous. The right pleural cavity contains a very small amount of clear, straw-colored fluid. There are firm, retracted scars, but otherwise the lung is normal.

Pericardial Cavity: It contains a slight excess of fluid. The heart is very small and contracted, weighing 230 grams. The tricuspid valve admits four fingers and the mitral valve two fingers. The right ventricle measures 4 mm. and the left 14 mm. Both mitral and aortic valves show slight diffuse nodular thickening, but no ulceration nor vegetations. The aorta shows a fair amount of fatty degeneration.

Abdominal Cavity: The stomach is firmly adherent to the liver at its lesser curvature and posterior surface. On opening the stomach this is seen to be due to a large perforation of the stomach of about 2 inches diameter, causing a walled abscess between the upper and posterior surfaces

Fig. 4, Case 2.

of the stomach and the liver. The perforation is immediately distal to the cardiac orifice. On the lesser curvature and posterior wall of the stomach surrounding the perforation there is a mass, rather smaller than an orange, projecting upwards and backwards. It does not encroach upon the cavity of the stomach. The greater curvature and pyloric end of the stomach appear to be free from involvement. The glands along the lesser curvature are large and hard and those along the greater curvature are involved to a much less extent. The liver shows a large number of nodules, apparently carcinoma, scattered throughout its substance, each about the size of a marble.

In the right inguinal canal there is an

indirect omental hernia, below which is a soft, necrotic mass of about the size of a hen's egg, firmly adherent to the omentum. The other abdominal organs appear to be normal in every respect. On careful examination there are no signs of metastases to be found in the abdomen with the exception of those noted above.

Microscopic Examination: The growth in the stomach, liver and the wall of the necrotic mass in the inguinal region all show the same structure, condition of red hepatization.

Pathological Diagnosis: Carcinoma of stomach with metastases in liver, regional lymph glands and right inguinal canal. Lobar pneumonia.

X-ray Findings: The interesting, and, to me, striking feature of this examination was the bulging of the outer portion of right diaphragm by a gas-distended hepatic flexure. The liver seems to have been displaced to the left to allow this to occur. The postmortem examination showed no evidence of an unusually high hepatic flexure nor of displacement of the liver to the left.

I am unable to satisfy myself as to the cause of this disposition, and would appreciate comment.

REPORT OF CASE OF GIANT COLON WITH IMPACTED FECES IN THE SIGMOID

By CHARLES G. SUTHERLAND, M.B. (Tor.),

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Case A201033. A man, aged twenty-three years, was admitted to the Clinic July 12, 1917, complaining of obstinate constipation with a mass in the right lower abdomen. He had been troubled with constipation since birth, had always had to depend on enemas for bowel movements, and had gone as long as four weeks without one. Various purgative waters and oils had given little relief. Ten years before, he had noted a firm, round mass in the right lower abdomen, which had slowly increased in size; it was not painful except when it was moved

Fig. 1. Dilatation of the descending colon with filling defect in the colon thought to be due to extrinsic pressure.

by enemas. After several days without a bowel movement there was always some bloating. Otherwise the patient was in good health; he had no nausea or headache.

A mass, about 12 cm. in diameter, was palpated in the right lower abdomen. This mass was smooth, more or less rounded, of putty-like consistency, and movable. A rectal enema disclosed the fact that the entire pelvis was occupied by the same type of tumor. Fluoroscopy and roentgenograms revealed the marked dilatation of the distal portion of the large bowel, with a filling defect in the sigmoid (Fig. 1), thought to be due to extrinsic pressure. A later roentgenogram showed the normal contour of the colon with a large central filling defect (Fig. 2), due to a foreign body in the bowel.

After two preliminary dilatations of the rectum and the removal of large quantities

of hard impacted feces, operation was performed August 7. The sigmoid and upper rectum were enormously distended (10 to 15 cm. in diameter), very white and thick walled. There were adhesions around the cecum, ascending and transverse colon. The colon was otherwise normal in appearance, and empty. The descending colon was normal, and there was no mechanical obstruction around the rectum to account for the enormous dilatation proximal to it. A three-stage Mikulicz operation was performed and the colostomy was closed February 12, 1918. The pathologic report on the tissues was "giant colon with markedly thickened walls and multiple stercorous ulcers." The patient recovered uneventfully, and a follow-up letter in July, 1919, elicited the information that his condition was satisfactory; the bowels were moving daily, usually two or three times in twenty-four hours.

Fig. 2. Filling defect in the sigmoid from impacted feces. Note that the normal contour of the bowel wall is retained.

THE GRANGER MASK FOR WATERS' POSITION

By I. S. TROSTLER, M.D., CHICAGO

The absolute uniformity of the results obtained by the use of the mask devised and recommended by Dr. Amédée Granger in the 107 and 23 degree angles "alveola-glabella" position, led me to wonder whether the mask could be used to equal advantage in the Waters' position.

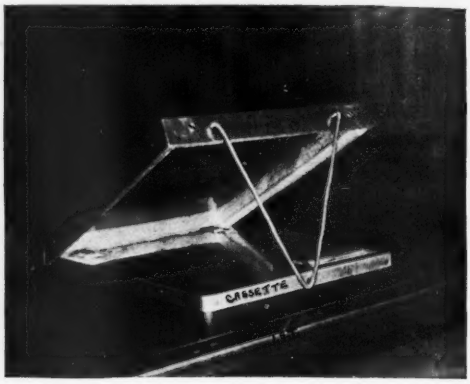

Fig. 1. Diagonal view.

Fig. 2. Side view.

I had George Brady bore two 3/32 inch holes two inches from the corners in both ends of my Granger mask, and after placing the mask in the 45 degree angle by means of a piece of heavy wire bent to fit into the holes at the upper end so as to retain it in

that position (leaving the cassette upon the table), I found that the results obtained were equally satisfactory and uniform. I think that this is a desirable new use for Dr. Granger's valuable mask. (See Figures 1 and 2.)

CASE REPORT OF A LARGE FECOLITH

By SAMUEL BERESFORD CHILDS, M.D., DENVER

Mrs. N., aged 40, referred for X-ray examination January 26, 1924, by Dr. E. F. Dean, of Denver, from whom I obtained the report of his examination as well as the clinical symptoms. She had consulted Dr. Dean for a suspected obstruction in the rectum or lower colon from which she was unable to obtain relief by evacuating the bowels. Upon examination through the vagina a mass was felt posterior to the upper part of the vagina which was thought to be probably a growth involving the anterior wall of the rectum. Upon examination, by rectum this time, the mass was not felt.

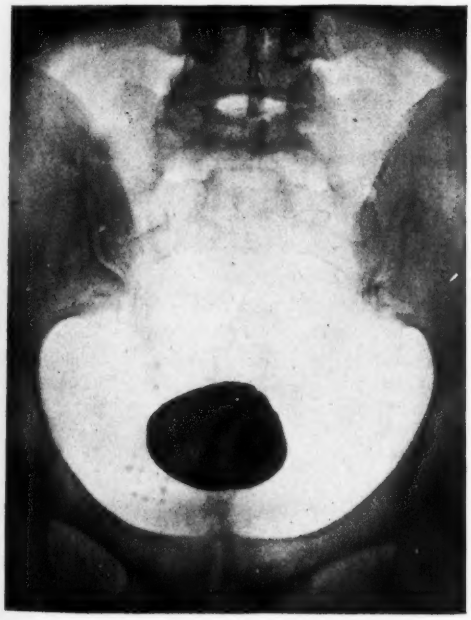

Fig. 1. Large fecolith attached to the anterior wall of the rectum.

When the patient reported for X-ray examination she refused to take the routine barium enema under fluoroscopic inspection with a physician present, but consented to have this enema administered by one of the female assistants. The enema, apparently, passed readily into the colon, as shown by the film made shortly thereafter, and the entire colon showed no irregularity or filling defects.

Fig. 2. Appearance of the fecolith after crushing, showing thickness of shell and line of fracture of same.

After an evacuation of the bowels another film was made which disclosed in the pelvis a large circumscribed dense mass with sharply defined contour. Since some of the clysma still remained in the colon, she was asked to report in two days. At this time the colon was free from the enema and the film taken showed the same sharply defined mass as mentioned (Fig. 1). The appearance of this mass simulated that of a very large stone in the bladder. Clinically no signs were present to indicate the presence of a stone, and an examination of the urine showed it to be normal.

A calcified pedunculated fibroid was considered as a diagnosis, also the possi-

bility of a large mass of calcified glands, but the edges of the mass were too sharply cut to warrant the assumption that either of these conditions existed. The only other diagnosis considered was that of a large fecolith, and although such a mass as depicted on the film had never been seen by the writer, the diagnosis of a large fecolith was made. This diagnosis was given to the surgeon, who was able at this time, with considerable difficulty, to feel the mass by rectal examination and to detach it from the anterior wall.

The following day, by examination *per vaginam*, the mass was found to be freely movable and could be pushed down to the sphincter but not through it.

Injections of oil were given for a few days but the mass not being expelled, an attempt was made to crush it. The results were only fairly successful, as only a part of it was expelled.

On February 8th, thirteen days after the first examination, the patient requested that another film be made to determine whether the mass had entirely disappeared. The result of this examination is shown in Figure 2. On this plate the fracture lines are apparent and the thickness of the shell is shown. Some of the shell had been expelled and was described by the patient as amber in color, with sharp edges, which caused her definite cutting pains when evacuated. The shell surrounded a hard fecal mass. The remnant shown in Figure 2 was passed some time later.

Radiology and clinical medicine. — The writer feels more indebted to his colleagues in radiology for help and guidance in diagnosis and treatment of his patients than any other single branch of the medical profession.

In the conception of the nature and extent of disease processes, clinical medicine is capable of contributing admirably clear pictures as the result of careful examination of the surface of the body. By the exercise of trained hand and ear, physical signs of lesions lying beneath the surface can also be elicited. For ocular demonstration, however, of any disease process, which affects deeper structures, the physician is dependent upon three methods: the postmortem studies, observations during operations, and radiologic studies. In the postmortem study of disease, the great element of function is missing. Observations during operations are very limited, for the sake of the best interest of the patient. The radiologist, however, is able in many cases to study both structure and function; he has ample time for his observations, and he can submit these to such of his colleagues as are competent to offer suggestions and interpretations resulting from their own special experience of disease in other fields.

Against these obvious advantages the radiologist's observations are much more difficult and therefore his interpretations of what he sees are much more liable to error. The radiologist deals with shadows rather than with substances, and this fact alone places a serious limit, if not to the range of his methods, at least to the rate of his progress.

The writer is not one of those who regard the radiologist as a mechanic or as a photographer, though he is aware that some radiologists aim at little else. There is no reason why the radiologist should not be a clinician in spirit; indeed, there is every reason why he should be, for to divorce clinical medicine and radiology is to impoverish both. Closer co-operation between the clinician and radiologist, and more exchange of views are desirable factors in the diagnosis and treatment of those diseases which have points of interest to them both. It is very important, however, that the radiologist should know the limits of his method, or rather, that he should not strain his method past its possibilities in his interpretation of results. If he does this, he is no longer giving us the valuable help of his technic and of his powers of observation —he is theorizing.

In conclusion, the writer emphasizes the fact that the essential unity of pathologic processes must not be lost sight of. Though clinical medicine sees one aspect of a disease, radiology another, morbid anatomy a third, and parasitology a fourth, the disease is one and the same, and the best conception of it is obtained not by undue insistence upon any one of those aspects, but by a proportionate mingling of the pictures presented by all.

SOLOMON FINEMAN, M.D.

The Influence of Radiology upon our Conception of Disease. Thomas Horder. Brit. Med. Jour., July 19, 1924, p. 88.

EDITORIAL

M. J. HUBENY, M.D. . . . . *Editor*
EDWARD W. ROWE, M.D. . } *Associate Editors*
BENJAMIN H. ORNDOFF, M.D. }

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YOUR SOCIETY

A man is known by the company he keeps, and a society is known by the character of its membership. The wonderful upgrowth of the Radiological Society of North America has been due to the faithful allegiance of its members, and the future is distinctly in their hands. No committee, no enthusiastic group can supply that necessary interest and energy which is the privilege and duty of the whole membership.

It is an unfortunate tendency, sometimes observable in a society, to regard the organization as a professional unit of machinery to be used for personal gain and glory. A society is an organization of like-minded men, who, by collecting themselves into a group, are able to promote, inculcate and disseminate those facts and measures which have been established, or ideas which are new and should be appraised as to value, so that in the exchange of endeavors, be they what they may, all concerned will be protected as to value, integrity and ability. Co-ordinated mass movement will accomplish feats impossible of individual attainment.

It seems obvious that a member to whom this Society means all that it should mean, will want men he likes to share the same privileges, to join the growing group of reputable physicians who seek to participate in a highly organized body, representative of the highest ideals and efficiency. It forms the ideal meeting-place for friends to renew acquaintanceship, and affords unusual opportunities for men to draw together and exchange that mutual confidence which leads to understanding and friendly tolerance.

This is a progressive era; the multitude of activities and the high degree of efficiency compel those who do not wish to be engulfed by waves of disaster and helplessness to surround themselves with such colleagues as enhance their own value from every angle.

It should be the pride of the membership to see that the privileges are brought to the attention of men of similar aims to their own, whose presence will enhance the organization, and whose companionship will be of value. In a society so generously proportioned as ours there is no excuse for any prospective member to fear lest he shall feel lonely or be without one or more men of his own kind with whom he may share its privileges and opportunities. *His chance to ensure that companionship is now.*

Will you not ask your friend to-day? You will be extending to him a courtesy for which he will feel grateful. Impress upon him the forum in which he will participate and the humanizing richness of scientific, social and friendly contact—memories that are imperishable.

M. J. HUBENY, M.D.

EDITOR'S NOTE

With this issue RADIOLOGY enters upon the second year since the change in publication. This change was made in conformity with the expressed wish of the Society, as enacted at San Francisco, during the June meeting of 1923 and re-enacted at the meeting held at Rochester, Minnesota, in December, 1923.

It has been the endeavor of the editorial staff to make it a high grade publication, one worthy of the organization it represents. If you like it and wish to share in

keeping up its present standard, remark about it to your friends. Also, patronize the advertisers who are using its pages. It is partly through this advertising patronage that the magazine can grow. Many features have been planned to improve this publication month by month, but the only way that it will be possible to carry out these plans will be by securing the full support of the members and by having them patronize the advertisers, whose interests and activities are delicately but firmly intermingled with our own.

M. J. HUBENY, M.D.

INTERNATIONAL CONGRESS IN RADIOLOGY, LONDON

Our English confrères propose to call an International Congress in Radiology for the early part of July, 1925, to be held in London. The tentative program contemplates that three days be devoted to the reading of papers and three days to the visiting of hospitals in London, and that other radiological centers like Liverpool, Manchester, Edinburgh, Glasgow and the universities of Oxford and Cambridge be visited. This, together with sight-seeing, will consume approximately three weeks, so that the trip to England, the sojourn there and the return trip to the United States ought to take, depending upon the speed of the steamer, from five to six weeks.

It has occurred to several American radiologists that while the trip to England is made, we might with great profit extend our trip to the Continent, visiting France, Germany and Austria, winding up with a visit to Stockholm, which is to-day, thanks to the genius of Dr. Forssell, one of the great radiological centers of the world.

With this object in view, inquiries were made of several of the great touring agencies, with the following result:

Providing the party has a minimum number of sixty, and the travel is on the one-class cabin steamers instead of on the luxurious liners, and the traveling abroad is done in second-class railway carriages (third-class or auto buses for England), the following rates are given:

New York to London; seven days in London; one day at Oxford; one day at Cambridge; one day at Manchester; one day at Liverpool; one day at Edinburgh, and one day at Glasgow, with some sight-seeing through the picturesque parts of England, particularly the so-called Shakespeare country, and return to the United States: the cost per person will be approximately $575 to $595.

If the itinerary is to include France, visiting the Radiological Institutes of Paris as well as sight-seeing, and visiting parts of France, particularly the battlefields, devoting approximately two weeks to that, the cost will be increased by $175 to $235, meaning a total of $750 to $830.

If the trip is to be extended farther on the Continent, visiting Frankfurt, Freiburg, Munich, Erlangen, Vienna and returning by way of Prague, Dresden, Berlin to Hamburg, the cost will be increased by $245 to $260, making a total of $995 to $1,090.

If, however, we are to go to Stockholm and from there home, the cost will be increased by from $180 to $230, making a total of $1,175 to $1,320.

One of the touring agencies states that the approximate figures submitted include the following:

"The exclusive services of an experienced and capable Tour Manager, who will devote his entire time to the welfare of the parties. He will be assisted wherever necessary by fully qualified local guides.

"Stateroom, berth, and meals on trans-Atlantic liners to the value of $275, including war tax, railway transportation in Europe, third class in England, second class on the Continent, first class on all local steamers, including the Channel boats.

"Hotel accommodations *without* private bath. The latter can be arranged for by individuals desiring it, at extra cost.

"Three meals a day everywhere. When traveling or sight-seeing, meals include those served in the dining-car or any suit-

able restaurant. (Wine or other beverages are not included.)

"Comprehensive sight-seeing trips at each place visited. All local taxes paid. Also tips and fees to hotel servants, porters, etc., on sight-seeing trips while with Tour Manager.

"Transfer of passengers and baggage between railroad stations, piers and hotels. One hundred pounds free baggage allowance."

The following items are not included:

Tips to stewards on trans-Atlantic liners; wines, liquors, beers, mineral waters and other beverages; laundry and expenses of passport and visés. (The tourist company will, however, obtain the necessary visés after the passport has been secured.) Sightseeing other than specified as included in the itinerary.

In order to obtain proper accommodations it is necessary to inform the touring agencies as soon as possible of the number intending to take the trip and of the decision regarding the itinerary. They were promised that early in September the final decision would be reached. Now is the time to make up one's mind to take the trip next year, and whether one shall do so alone or in company of his family. Members of the American Roentgen Ray Society and of the Radiological Society of North America are allowed to invite guests, who need not necessarily be physicians.

To start the ball rolling, it is suggested that those desiring to take the trip or wishing to obtain information communicate as soon as possible with Dr. L. Jaches, 27 East 95th Street, New York City.

REGULATIONS FOR HANDLING AND STORING X-RAY FILMS

Regulations for storing and handling of photographic and X-ray nitro-cellulose films presented by the committee on hazardous chemicals and explosives of the National Fire Protection Association were tentatively adopted by that association at its meeting May 13, 14 and 15, 1924.

The article pertaining to the general storage of unexposed films in hospitals and similar institutions reads as follows: Storage of unexposed films shall be in metal boxes or cans on shelves two feet above the floor, or in approved double walled cabinets vented to the outside air. In regard to the storage of exposed films in hospitals and similar institutions the regulations read as follows: All films shall be kept in vented cabinets or in a vented storage room.

The specifications for vented cabinets are (1) no cabinet shall exceed thirty cubic feet capacity; (2) cabinets shall be of approved insulated construction; (3) cabinets having a capacity in excess of 250 pounds of film shall be divided into at least two distinct compartments; each compartment provided with an independent door and vent. The separating partitions should be practically air tight and of substantial construction equivalent to the sides; (4) cabinets holding over 100 pounds of film shall be equipped with at least one automatic sprinkler. If divided into two or more compartments, they shall have at least one automatic sprinkler in each compartment; (5) each compartment shall be provided with a vent to the outside air. The vent shall have a cross-sectional area of at least one square inch per cubic foot of capacity of the cabinet.

Rules for vented storage rooms read as follows: (1) Walls or partitions, floors and ceilings shall be of a type affording one hour protection. Walls shall be continuous from floor to ceiling and shall be securely anchored. Construction of vented storage rooms affording one hour protection includes the following: (*a*) reinforced concrete; (*b*) metal lath with solid cement plaster not less than two and one-half inches thick; (*c*) three-quarters of an inch of cement or gypsum plaster on metal lath on each side of studs; (*d*) brick, tile, or hollow concrete blocks plastered on each side to a thickness of one-fourth inch.

(2) Openings from the storage room to other parts of the building shall be protected by a fire door on each side of the

wall. Doors shall conform as to construction and installation to Class B of the regulations for the protection of openings in walls and partitions against fire. The interior door shall be automatic. The outer door shall be of the swinging type and close into a rabbet, or otherwise be made tight to prevent passage of flame around edges; it shall be self-closing, and if fastened open shall be arranged to close automatically in case of fire originating inside or outside of the storage room. (3) No skylights shall be permitted. (4) Slatted shelves shall be divided vertically at intervals not exceeding ten feet. Backs and divisions shall be preferably of incombustible material or of seven-eighths inch tongued and grooved boards or their equivalent in resistance to heat and gases. Slats shall be not over four inches wide and spaced at least one inch apart. Aisle space shall be at least three feet wide. Height of racks shall be not over eight feet and in no case shall stock be stored higher than two feet below sprinkler deflectors. (5) An automatic sprinkler head shall be installed in the center of the aisle opposite each section. The area to be covered by each sprinkler head shall not exceed sixty-four square feet of floor area. Proper baffles shall be provided between heads. Note: A room so located on the roof as not to endanger other parts of the building requires automatic sprinklers only when salvage of the contents is desired or where there is probability of panic from the fumes. (6) Adequate ventilation shall be provided. The area for ventilation shall be equal to a clear opening of at least one-half square inch per cubic foot of room. Such ventilation may be provided by installing approved heat releasing devices on the windows, preferably on the upper sash, arranged to open windows automatically in case of fire. (7) Heating should preferably be by hot water. Where steam heating is used only low pressure steam shall be permitted, radiators or coils shall be on ceiling or shall be adequately screened and pipe lines shall be protected and screened.

The general rules as to the wiring and equipment of such rooms conform to the National Electrical Code, as follows: (1) Only incandescent electric lights shall be permitted. In storage rooms these shall be protected either with substantial wire guards or vapor-proof gloves, or both. (2) The use of portable lights on extension cords in any storage rooms is prohibited. (3) Smoking shall be prohibited in rooms where film is stored or in developing or similar work rooms. Conspicuous "no smoking" signs shall be posted in prominent places. (4) No film shall be stored within two feet of steam pipes, radiators, chimneys, or other sources of heat. (5) Fire pails or extinguishers shall be provided as required by the inspection department having jurisdiction. (6) Discarded film shall be stored and handled in the same manner as other film until removed from the premises.—*Reprinted by special permission from "The Modern Hospital," July, 1924, page 18.*

The American Roentgen Ray Society will hold its Twenty-fifth Annual Meeting at Boston, Massachusetts, September third to sixth, 1924.

DO YOU BELONG TO THE "CLIQUE"?

What is the Clique? 'Tis a body of men
Who attend every meeting, not just now and then,
Who don't miss a meeting unless they are sick—
These are the men that the grouch calls "The Clique."

Who don't make a farce of that magic word, "work,"
Who believe in the motto—"Not a job will I shirk";
Who never resort to an underhand trick,
These are the men that some call "The Clique."

The men who are seldom behind in their dues,

And who from the meeting do not carry news;
Who attend to their duties and don't seek a kick.
These are the men that the crank calls "The Clique."

We should be proud of members like these—
They call them "The Clique" or whatever they please,
But there are some people, who always find fault,
And most of this kind are not worth their salt;
They like to start trouble but seldom will stick—
And leave all the work to be done by "The Clique." —*Selected.*

BOOK REVIEWS

DISEASES OF MIDDLE LIFE. The Prevention, Recognition and Treatment of the Morbid Processes of Special Significance in This Critical Life Period. Comprising twenty-two original articles by various eminent authorities. Edited by FRANK A. CRAIG, M.D., Associate Director of the Clinical and Sociological Department of the Henry Phipps Institute of the University of Pennsylvania. In two volumes, illustrated. F. A. Davis Company, Philadelphia, Publishers, 1923. Price $15.

Middle life is the period from the ages of forty to seventy. These are the productive, fulfilling years of existence. The body attains complete growth at thirty-five. It is then that the insidious changes in bodily chemistry begin that alter the succeeding years so tremendously. It is then that the habits of diet, occupation, exercise and the influence of infections begin to display themselves. It is then that catabolistic cohorts force a majority report in any metabolistic conference. The anabolistic forces have spent all their energies in the earlier years.

The eternal ambition to live longer and comfortably is the urge behind these two large volumes. Probably we know more in this generation than any previous one has known about how to live longer. Certainly we have more statistics. Certainly we know more about metabolism. Certainly we know more about focal infections, about heart disease, about the chemistry of foods, about exercise, about diet.

How are we going to apply this increased collective knowledge? How are we going to induce the people to take advantage of this knowledge?

One excellent program demands periodic or annual physical examinations. Have a health examination upon your birthday! Strike an annual physical trial balance! Take an annual health audit! Measure your health and physical well-being each year!

Many lay (commercial) organizations are promoting health examinations. A very few county medical societies are establishing annual health examinations by the family physician. The public must be educated, cajoled, and forced to this program. It must be made more attractive. It must become popular—aye, even fashionable. It must be sold to them, to use the modern rotarian phrase.

Where does the physician profit by this program of periodic health examinations? He profits by the increased span of life of a larger population. He profits by the incidental illnesses of this increased total population. Then there is the confidence of the people inspired by a program of health and preventive medicine by the medical profession. Health will be realized by the application of knowledge gained by studious physicians rather than cultist spasms and prayers. Religious zeal does not kill germs, eradicate focal infections or vaccinate.

"But," you ask the reviewer, "what has all this to do with these two excellent volumes?" Just this. Craig has conspired to secure the assistance of twenty-two eminent authorities in providing a scientific analysis of "The Diseases of Middle Life." Craig says: "The time to prepare for old age is early in middle life, to detect beginning disease at a time when it is still amenable to treatment and to so guide and direct the individual that the disease process may be so checked or converted that it will not interfere with the fitness of the individual."

The first four chapters strike keynotes. They include Diet, Muscular Exercise, Occupation and Diseases of the Heart. Of course, there are the succeeding chapters which run the gamut of medicine: Chronic Disease of the Arteries, Kidneys, Diabetes, Respiratory Tract, Stomach and Intestines, Liver, Gall-bladder and Pancreas, Pelvis, Mental and Nervous Diseases, etc. There are chapters upon Gout, Obesity and Asthma. And many others.

It appears that the basic chapters upon Diet, Exercise, and Occupation are the better written and contain new and valuable applications of the recent knowledge. It is regrettable that the matter of periodic examinations does not come in for more discussion than Craig affords in his excellent introduction. Physicians generally require a good deal of instruction in health analysis. We have been over-trained in disease and well-established symptomatology. We need to know more about early anticipatory symptoms. We are trained in the reading of the thermometer rather than the barometer.

Craig has an excellent list of collaborators. Names like Piersol, Talley, Papper, Lichty, Friedenwald, Basseler, Sailer, Knowles, offer sufficient conception of the calibre of the chapter-authors. They have done their labors well.

E. H. Skinner, M.D.

Anatomic Cross Sections of the Human Trunk (Life Size). By A. U. Desjardins, M.D., Section of Radium and X-ray Therapy, Mayo Clinic, Rochester, Minnesota, with Foreword by Charles H. Mayo. Price, $25.00. Published by Paul B. Hoeber, Inc., New York, June, 1924.

A long-felt need, to make more accurate and to facilitate the work of the radiologist, has been the charting of the body in cross-section at various levels. This has been done in life size, thereby requiring no amplification in estimating calculations.

The character of the type, the size of the charts, and the quality of cardboard make a combination lending itself to admirable mounting so as to be easily visible and convenient to handle, although a suitable portfolio comes with the complete set.

The following Foreword by Dr. Charles H. Mayo is more admirably suited as a review than the efforts of the reviewer:

"The most satisfactory stage in the development of new medical procedures is the period when cut-and-fit methods of early development are replaced by accuracy, which covers selection of the case, conditions of treatment, measurement of the remedy and its accurate application. This period has now been reached in the treatment of disease by radiation. The necessity for accurate knowledge of intervening tissue, of the depth of penetration and of the strength of the radiations employed, is apparent to all.

"In preparing these cross-sections of the average male and female bodies at various levels, Dr. Desjardins has rendered a distinct service to the radiologist, who will now be able to study his penetration data and dosage with relation to definite standards. Such charts will be useful, not only to the therapeutic radiologist, but also to the roentgenologist in the interpretation of roentgenograms, and to the surgeon, particularly in dealing with the localization and extraction of foreign bodies."

M. J. Hubeny, M.D.

A DESCRIPTIVE ATLAS OF RADIOGRAPHS OF THE BONES AND JOINTS. For Students and Practitioners. By A. P. BERTWISTLE, M.B., CH.B. (Leeds), Resident Surgical Officer, General Infirmary, Leeds. 8 vo, cloth, 198 pages, 299 radiographic illustrations. Published by William Wood and Company, New York, 1924. Price, $5.00.

This Atlas contains many illustrations, silhouetted in form and of good quality. It is comprehensive, the divisions comprising, first, "Normal Bones and Epiphyses," showing developmental progress at various ages; second, "Fractures"; third, "Diseases of Bones"; fourth, "Injuries and Diseases of Joints," and fifth, "Miscellaneous."

Many legends not only deal with X-ray interpretation, but also touch upon surgical measures such as reduction of fractures, splints, position, etc.

Because of its brevity and good qualities, and the moderate price, it should be much in demand.

M. J. HUBENY, M.D.

ABSTRACTS OF CURRENT LITERATURE

Radiation in gynecological practice.—The technic for uterine fibroids is 120,000 volts (9-inch gap), 7 to 12 inches distance, 5 ma., 5 mm. Al. with sole leather, 5 to 17 minutes. Cross-fire method through ports of entry from 2 to 4 inches in diameter.

The term "cure" should be defined more accurately, as to whether it refers to disappearance of the tumor or disappearance of symptoms. A patient "cured" should mean that the pathology is no longer demonstrable, that the symptoms have disappeared and that the patient is in normal health.

The tissue changes induced by X-ray include inhibition of ovaries, stimulation and finally disappearance of the glandular secretions, atrophy of the capillaries, destruction of myoma cells.

The conditions which can be remedied by X-ray are reduction of adhesions, recession of *small* ovarian cysts, disappearance of erosions and degenerations of the cervical glands, relief of pruritus vulvæ, relief of dysmenorrhea, shortening of a troublesome menopause, control of hemorrhage of menopause, production of sterility in selected cases, recession of uterine fibroids. In this latter case, errors of diagnosis usually account for failures, and the rule should be followed that tumors which do not yield to two or three series of X-ray should be operated upon. The following types are better operated upon: pedunculated growths, submucous tumors, tumors associated with anemia, chills and fever, chronic tumors that grow suddenly, tumors associated with ovarian cysts, tumors associated with gonorrheal infection, large non-vascular tumors, tumors in women who desire children and who can be relieved by myomectomy.

Of 140 cases of uterine fibroids treated, 75 per cent show no demonstrable tumors; the remaining cases include those that show signs of entire disappearance, those that are free from symptoms and are in excellent health though with small tumors left, those markedly relieved and in good health at present, but probably eventually surgical. There were only four outright failures in the series.

Some of the objections to X-ray treatment are without foundation, such as the frequently stated one that fibroids may become malignant. The danger of cancer developing in a cervical stump after a supravaginal hysterectomy is far greater than the danger of malignant degeneration of a fibroid. There is definite reason to think that X-ray treatment of fibroids diminishes the likelihood of cancer developing.

X-ray is preferred to radium for several reasons: fractional doses of X-ray give time for readjustment; larger tumors are more successfully reduced; X-ray gives better control of hemorrhage; danger is greater from radium; X-ray does not require loss of time or hospitalization; X-ray covers a wider field of possible pathology.

W. W. WATKINS, M.D.

The Uses of X-ray in Gynecology. Mary Elizabeth Hanks. Jour. Ia. St. Med. Soc., Feb. 10, 1924, p. 45.

Differential diagnosis of pulmonary conditions.—There can be no doubt that the intrinsic value of the roentgen ray for diagnostic purposes far surpasses that of any other laboratory examination, and in many cases it is the only means of reaching a correct diagnosis. But the burden of diagnosing pulmonary conditions must not be transferred from the clinician to the roentgenologist.

Although no other diagnostic method will so definitely reveal diseased hilum glands, still the X-ray does not throw light on the etiology of the enlargement.

Peribronchial infiltration usually defies detection on physical examination, though readily shown by roentgenograms. On the other hand, similar shadows are cast by conditions other than tuberculosis, such as chronic bronchitis, bronchiectasis, anthracosis, silicosis, and lymphangitic malignancy.

The negative X-ray should not rule out early lesions at the apex, when the physical findings and particularly the history are positive.

Cavitation with surrounding parenchymatous infiltration is almost pathognomonic of tuberculosis, and it is pathetic to watch the keenest clinician miss fairly extensive cavitations which speak for themselves on the roentgenogram. If the communication between cavity and draining bronchus is temporarily blocked or if the cavity is filled with fluid, the physical signs of cavity will be absent. All areas of rarefaction are not due to tuberculosis, however; they may result from bronchiectasis, abscess formation, malignant metastatic nodules, streptothricosis and spirochetal gangrene. Therefore, physical examination and laboratory methods are always essential.

X-ray signs of miliary tuberculosis are not pathognomonic; similar shadows result from anthracosis, diffuse malignancy or bronchiolitis.

The differentiation of active and quiescent lesions by the X-ray shadows is difficult and uncertain.

In pulmonary malignancy, the X-ray will frequently point the way to a diagnosis, but there are many uncertainties and careful clinical history and other methods of examination are usually required to supplement the information given by the X-ray.

In pulmonary syphilis, the X-ray serves only to give suggestive indications which further clinical and laboratory findings need to substantiate.

W. W. Watkins, M.D.

Value and Limitations of the Roentgen Ray in Diagnosis of Pulmonary Affections. Barnett P. Stivelman. Med. Jour. and Rec., Feb. 6, 1924, supp., p. i.

Effects of irradiation.—The patients studied were from four clinical groups: (1) Leukemia, (2) Exophthalmic goiter, (3) Prophylactic postoperative breast cases, (4) Malignant disease in various parts of the body.

Exactly similar results were found in patients treated with X-rays or with gamma rays. The changes in metabolism were found to vary with the site radiated. Irradiation of the head, thorax, and limbs produced no change in the metabolism of the cases examined. Radiation of the abdomen produced definite urinary and blood changes. There was a sudden fall in the twenty-four-hour amounts of urine, urea, uric acid, ammonia, titratable acidity, creatinine, total nitrogen and phosphates. The volume of the urine was also greatly decreased. The uric acid and phosphates returned to normal in about five days. Blood analysis showed a marked decrease in the urea content, with very little change in any other of the blood constituents. Examination of the feces showed an immediate increase in the fecal fat content.

The authors believe that the effects of radiating the abdomen can be explained by a temporary inhibition of the function of the principal abdominal glands, such as the liver, pancreas and kidneys; and that their figures do not support the acute uremic theory of Anderson and Kohlmann. They could obtain no evidence of nitrogen retention, such as would be expected if uremia had been induced.

Radiation of the cervical region produced no changes in the metabolism as revealed by a study of the blood and urine, except an immediate fall in the excretion of urinary creatinine. The day after exposure this almost disappeared from the urine and recovery did not take place until about the fourth day. Practically no alteration in the blood creatinine content was found.

A number of cases were treated prophylactically with calcium chloride or sodium bicarbonate before radiation and all of these cases seemed to show less reaction.

J. D. Camp, M.D.

The Metabolic Changes Associated with X-ray and Radium Treatment. E. C. Dodds and J. H. D. Webster. Brit. Jour. Radiol., April, 1924, p. 140.

Bone metastasis following carcinoma.—In reviewing the literature, a total of forty-one cases showing osseous metastasis following carcinoma of the gastro-intestinal tract was found. They were distributed as follows: stomach, 32; gall bladder, 3; rectum, 2; bile ducts, 1; appendix, 1; pancreas, 1; colon, 1. The author reports five additional cases: 1 in the esophagus, 2 in the cecum, 1 in the sigmoid, and 1 in the rectum. The vertebræ seemed to be the favorite site of metastasis and the lesions were as a rule multiple. Bones distal to the elbow and knee were very infrequently involved. The age varied from twenty-one to sixty-four, the average being forty-three.

In the author's experience, bone metastasis following carcinoma of the stomach was very rare. In a review of the literature of the forty-

one cases showing bone metastasis following carcinoma of the gastro-intestinal tract, 32, or 78 per cent, followed carcinoma of the stomach.

Carcinoma of the small bowel was comparatively rare and the author found but four cases in three thousand gastro-intestinal examinations. The second portion of the duodenum seemed to be the favorite site. Carcinoma of the jejunum was exceedingly rare. In none of the cases showing bone metastasis was the primary malignancy located in the small bowel.

Carcinoma of the large bowel was found to be comparatively common, especially in the later years of life. The incidence seems higher in the rectum and sigmoid than in the proximal colon. In the author's experience, 50 per cent of all malignancies of the large bowel were found in the rectum and sigmoid. The number occurring at the flexures was small. According to Kaufmann, 60 per cent of intestinal carcinomata are located in the large bowel, and 5.25 per cent of all carcinomata are located in the rectum.

The author's cases showed a preponderance of metastases in the vertebræ. The proximal third of the femur also seemed to be a favorite site and all four of the author's cases of large bowel malignancy showed definite lesions in the femora. The osteoclastic type of metastasis was more common. In one patient who had a carcinoma of the cecum, the osteoblastic type of metastasis was found. These changes were extensive and involved the left humerus, scapula, ischii and pubis.

Following roentgen therapy some of the osteoclastic type cases take on the physical characteristics of the osteoblastic type. The bones become very dense and have the appearance of an osteosclerosis. The patients' general condition showed no great improvement and the pain persisted.

J. D. Camp, M.D.

Primary Carcinoma of the Gastro-intestinal Tract Accompanied by Bone Metastasis. Edward L. Jenkinson. Am. Jour. Roentgenol. and Rad. Ther., May, 1924, p. 411.

Dosage in cancer cases.—There are no exact standards by which therapeutic effects can be predicated, calculated or measured. The only criterion by which we can judge any radiation being used, is by its biologic effect on the patient. The very nature of newgrowths seems to forestall any standardization of doses for tumors. Clinical observation has repeatedly shown that two tumors of the same histologic structure may exhibit an entirely different life history of malignancy. There seem to be no well-marked boundaries in the microscopic structure of tumors. One heterogeneous group of cell structures grades off into another. For this reason, attempts to standardize tumor doses on the susceptibility of some type tumor have been unsuccessful. It seems, therefore, that the doses of roentgen ray necessary to destroy cancer, which is in itself a varying entity in malignancy, are definable only in similarly wide limits. It would seem that the dose depends on the possibilities of combination of histologic structure, on the stage of development of the tumor as well as on the little-understood tumor host himself.

It would be ideal to find a radiation dose fatal to each case of tumor, which could exert on the surrounding normals a stimulating effect, but unfortunately the cells of the various tissues have not this degree of differentiation of susceptibility, and the conception of such a dose must for the time being remain ideal. The margin of safety between damage to tumor cells and to normal cells is in reality an extremely narrow one.

The authors report the results of radiation in seven cases of advanced, cachectic, seemingly hopeless primary and recurrent cancers, all of which were inoperable. All were poor risks and nothing approaching a cure was hoped for. They conclude that (1) inasmuch as "erythema," "carcinoma," and "sarcoma" doses have no absolute value, dosimetry on a basis of these is an arbitrary technic; (2) in advanced cancer, radiation with the technic of fractional doses applied at intervals has given satisfactory results. The supposition is also advanced that in more favorable cases of carcinoma a similar technic may be as effective as more intensive radical therapy.

J. D. Camp, M.D.

Palliative Doses of Roentgen Ray in Advanced Cancer. E. T. Leddy and J. L. Weatherwax. Am. Jour. Roentgenol. and Rad. Ther., May, 1924, p. 429.

Foreign bodies in the bronchi.—Chevalier Jackson's work on bronchoscopy is one of the great contributions to American medicine. He showed that the most frequent site of lodgment was at or just below the giving off of the right upper lobe bronchus, the next most frequent being the corresponding spot on the left side; next in the stem bronchi, the dorsal branches more often than the ventral. The branch usually invaded is the large posterior one of the left lower lobe bronchus.

From the physical signs alone it is not possible, in most cases, to diagnose the presence of an ordinary pin in the bronchus, nor to decide its location, but X-rays clear up the diagnosis without difficulty.

In the case of non-opaque foreign bodies, the X-ray study should deal with changes in the lungs. Manges has been able to diagnose the presence of non-opaque bodies, practically as certain as the opaque ones. The changes in a group of cases with a ball-valve action were characteristic; if air entered the lung and could not escape there was obstructive emphysema on the affected side and compensatory emphysema on the unaffected side. This was first pointed out in 1911 by Iglauer. The signs of unilateral emphysema were: (1) greater transparency of the affected side; (2) displacement of the heart and mediastinal structures towards the unaffected side; (3) depression and partial fixation of the diaphragm on the affected side; (4) compensatory emphysema on the unaffected side, with increased excursion of the diaphragm. Secretion might accumulate below the foreign body and cause an increased shadow area, and it might be difficult, in early stages, to distinguish this shadow from that due to an abscess. If collapse of the lung was marked, it gave definite signs.

If a foreign body in the esophagus is obstructive, food and secretions enter the trachea, and may set up a considerable irritation suggesting a foreign body in the air passages. Absence of local signs, X-ray study, direct examination, and bronchoscopy, if necessary, give the diagnosis.

In only 2 per cent of Jackson's cases was the foreign body expelled without interference. When the major portion of a peanut had been removed by bronchoscopy, sometimes smaller portions were subsequently coughed up. In 99 per cent of these cases the results were successful. Practically all cases occurred in nut cases, despite removal of the body.

The profession are recognizing only a small proportion of foreign bodies in the lungs. The importance of bronchoscopy as a therapeutic method in bronchiectasis and lung abscess should cause a revolution in medicine, since such cavities could be washed out and satisfactorily treated through a bronchoscopic tube. The results are already extremely gratifying.

SOLOMON FINEMAN, M.D.

The Clinical Features of Foreign Bodies in the Bronchi. Thomas M'Crae. Jour. of Laryn. and Otol., June, 1924, p. 324.

Cancer of the esophagus.—Esophageal cancer is by no means an unusual disease. Nine-tenths of the cases occur in men, in whom it is exceeded in frequency only by cancer of the stomach. Carcinoma is the most frequent disease of the esophagus. It must be differentiated from tuberculosis or syphilitic strictures of the esophagus, cardiospasm, hysterical dysphagia, esophageal diverticula, and pressure from some extrinsic source such as aortic aneurysm or mediastinal tumor. If anything indicates esophageal disease one's full diagnostic powers should be brought into play. But whatever opinion one has, it should at once be put to the test of an X-ray examination, both screen and film, and this, before use is made either of a sound or an esophagoscope. The sound has no place in the diagnosis of cancer of the esophagus; the esophagoscope should always be preceded by an X-ray examination. For all practical purposes the roentgenologic evidence is sufficient. If there are no contra-indications, and the patient so desires, the case should be put in the hands of a surgeon, skilled in the necessary technic. At the time when the first symptoms are well established, when diagnosis should be made, a very large proportion of cases are operable, surely, over half. If the case is inoperable, treatment by radium and X-ray, with eventual gastrostomy, comes into view. The average expectancy of life after the first symptoms is six months. The success of curative surgery for cancer of the esophagus depends on the co-operation of the medical practitioners, who first see these cases, with the surgeons. As Sauerbach has said, the delay in having the surgeon see the case is not usually the result of a late diagnosis, but is due to the ruling opinion that the condition is absolutely inoperable. The greatest danger from sounds, radium, etc., is not the direct injury they may cause the patient, but is that the patients who should be sent for operation, who would be glad to have the operation, are treated by these temporizing methods until the golden hour of operability has passed.

SOLOMON FINEMAN, M.D.

Cancer of the Esophagus in General Practice. Gordon F. Helsley. Calif. and Western Medicine, March, 1924, p. 102.

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